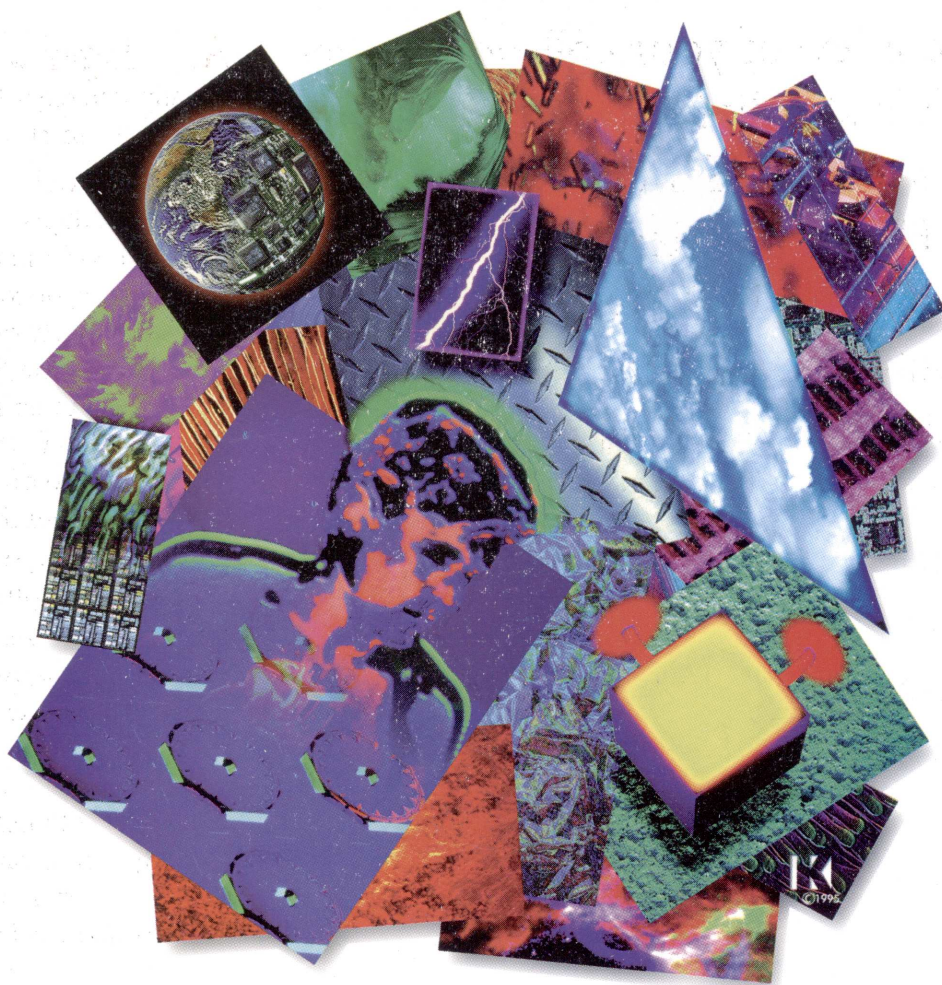


hp-ux/usr

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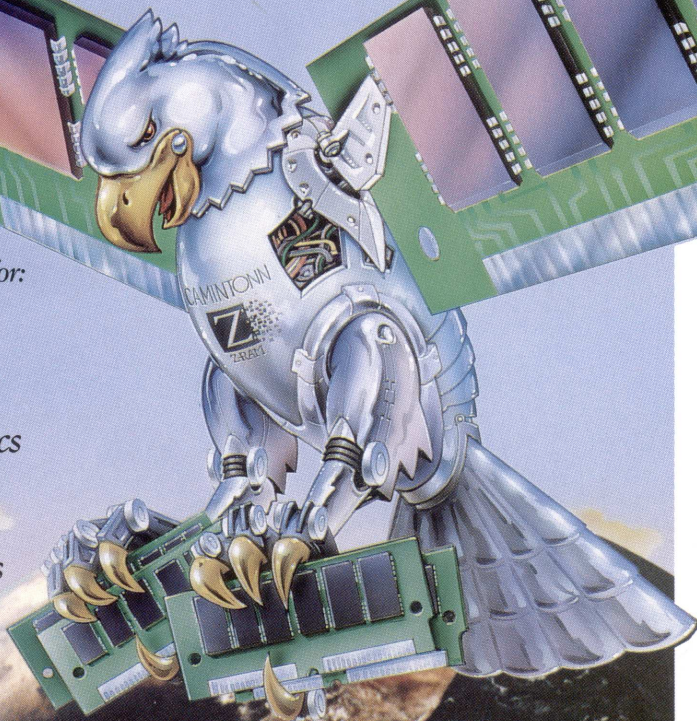
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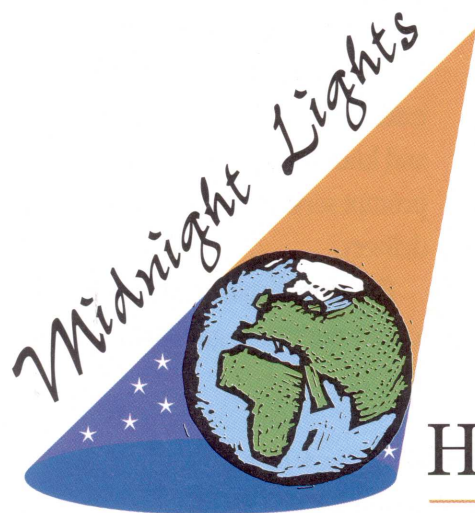
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Contents

Features

First Looks at Release 10.0	<i>by Bill Hassell</i>	22
Networking Background for System Administrators, Part 2	<i>by Marty Poniatowski</i>	34
X Application Performance Characterization Using X Terminals in a Client-Server Environment	<i>by Ken Oliver</i>	48
Barbarians Inside The Gate	<i>by Steen Hansen Hviid</i>	54
Software Review: Remedy Action Request System Version 2.0.1	<i>by Jeff Hodges</i>	64
Interex Toronto Conference		70

Departments

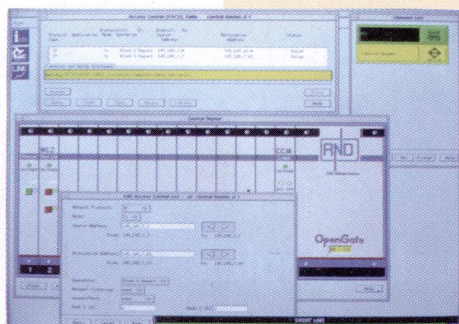
Q & A	8
HP 1000 Guru	82
CSL Perspective	92
Industry Watch	94
Product Focus	96
New Products	98

Columns

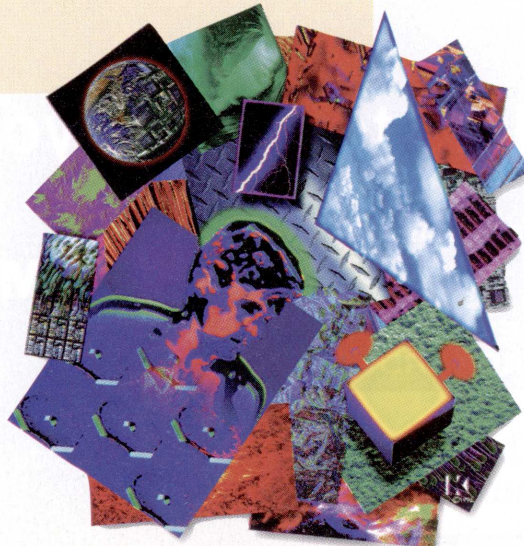
HP-UX Systems Administration	<i>by Chris Curtin</i>	16
HP-UX	<i>by David L. Totsch</i>	20
Internet Goodies	<i>by Joe Berry</i>	74
X-Watch	<i>by Larry Headlund</i>	78
HP-RT	<i>by Anita Harris</i>	86

page 48

New Products
See page 98

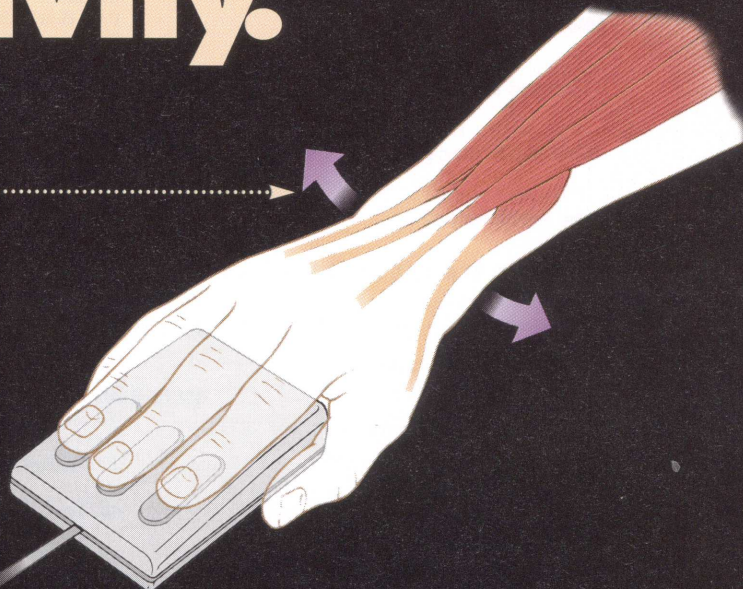
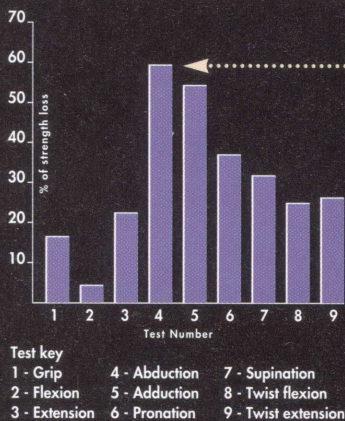


Cover Story:
See page 22



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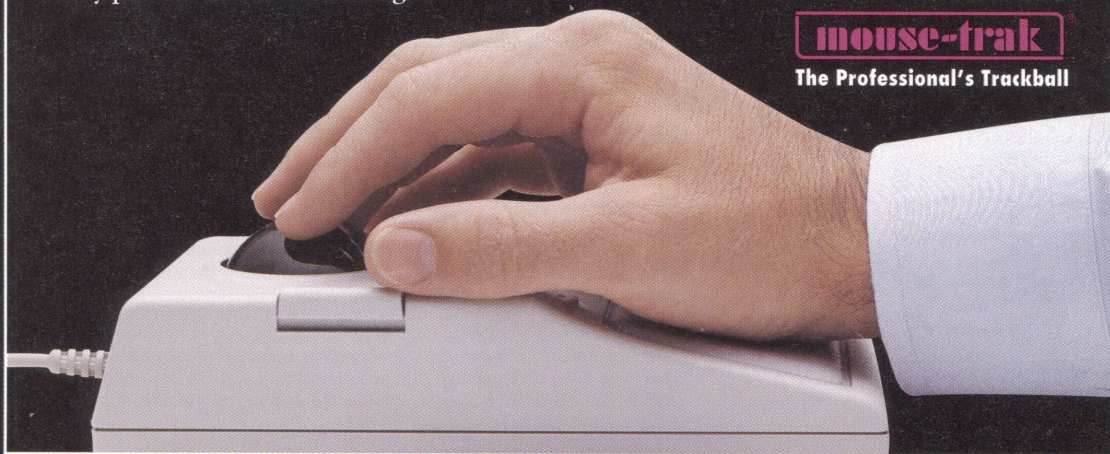
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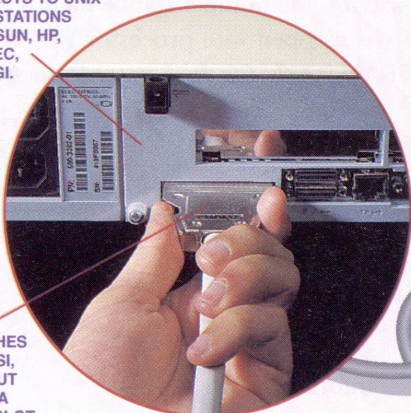
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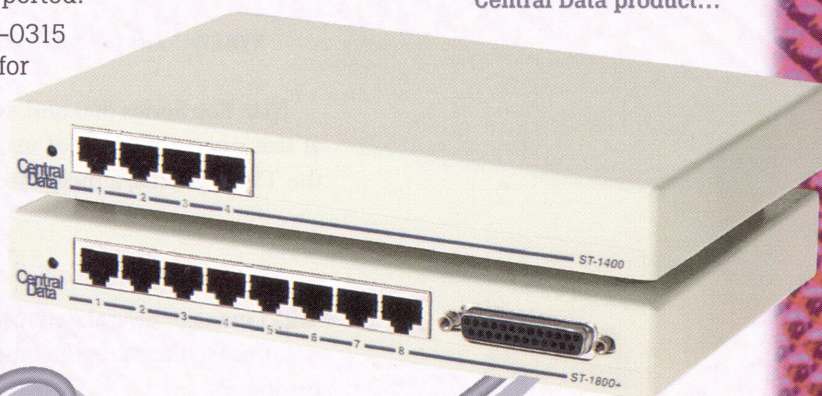
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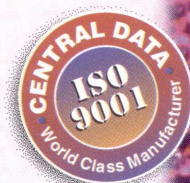
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Question & Answer

Q: How can I determine the amount of memory installed on my HP 9000?

A: One way is to run `/etc/dmesg`. Memory appears toward the end of the listing but if additional error messages have occurred since bootup, this information may have scrolled off the top of the `dmesg` buffer. Another way (for Series 800s at 9.0x) is to use `/etc/sysdef`, but both commands require root capability.

Here is a simple C program that will work for all users. The memory is reported in bytes.

```
/* Get actual memory size in bytes */
#include <stdio.h>
#include <sys/pstat.h>
main()
{
    struct pst_static buf;
    pstat_getstatic(&buf, sizeof(struct pst_static), 1, 0);
    printf("%d\n", buf.physical_memory * buf.page_size);
}
```

To get the memory reported in megabytes, use something like this in a script:

```
MYMEM=`/usr/local/bin/memsize | awk '{print $1/1024/1024}'`
```

Note: For Series 300 and 400 systems, the number will be slightly less than actual size since a portion of memory is mapped with processor ROMs. Similarly for the T500 systems, a megabyte of RAM is held for the Service Processor.

Q: I manage several systems and need to know summary details about each system, e.g., the architecture, the base revision, and the PCO or change level. How can this be done?

A: Here's a script to report that information:

```
#
# Test for the primary 9000 architecture
#
if [ ! /bin/hp9000s300 ]
then
    ARCH="300/400"
else
    if [ ! /bin/hp9000s700 ]
```


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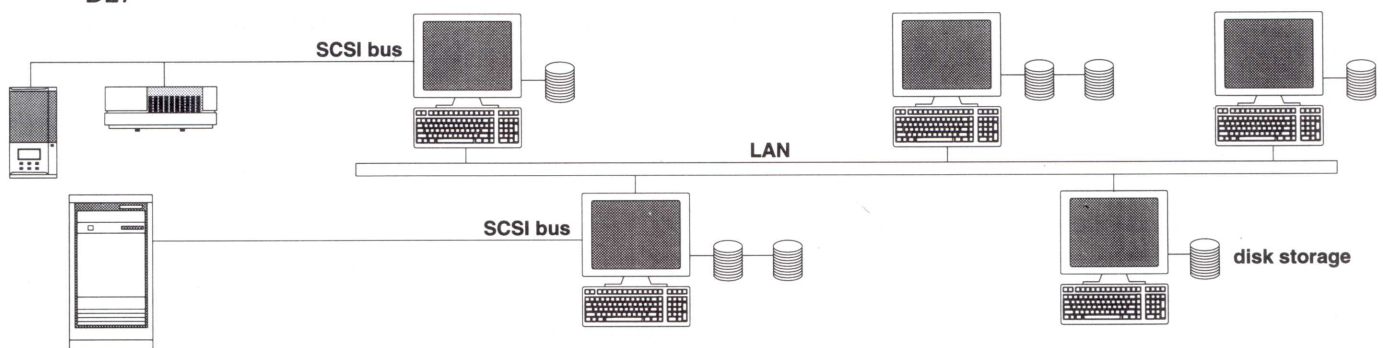
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```

then
    ARCH="700"
else
    ARCH="800"
fi
fi
#
# find uname bits and pieces for use later on
#
MYREV=`uname -r | /usr/bin/cut -f 2-3 -d . | /usr/bin/cut -c 2-5`
MYCPU=`uname -m | /usr/bin/cut -f 2 -d /`
#
# find the rev of the PC0 from the INDEX file in /system/UX-CORE/index
# (for 8.0 and 9.0 systems) or from /system/UX-CORE/kernrel for 7.0.
#
if [ "$MYREV" -lt "8.00" ]
then
    MYPC0=`head -1 /system/UX-CORE/kernrel`
else
    MYPC0=`/bin/grep fv /system/UX-CORE/index | /usr/bin/cut -f 2`
fi
echo "Series: $ARCH at revision $MYREV, PC0 level is $MYPC0"

```

Here's a way to locate the type of PA-RISC architecture used in a specific system:

```
grep `uname -m | sed s:9000/::` /usr/lib/sched.models
```

This will produce something like this:

```
897 1.1b PA7100
```

where 897 is the machine model, 1.1b is the PA-RISC version, and PA7100 is the chip type used in the system.

Q: I am watching the output from *sar* and *Glance* concerning the kernel parameter *ninode*. No matter how big I make it, it is always shown as full. Is this a bug?

A: Customers have often been concerned that the inode cache shown by such commands as *sar(1m)* is perpetually full. The output of *sar-v* includes something of the form:

```

... inod-sz ov ...
... 1196/1208 0 ...

```

where the total size of the inode table is usually close to the number of inodes listed as "in use," even when the "table overflow" flag is never set.

The inode table is a static-size table (configurable by tuning *ninode* in the kernel) that is used whenever a file is opened anywhere on the system. For any file held open, one entry is allocated in the inode table to keep track of any information about that file. As the file or its attributes change, the information in memory is updated, and that information is also written to the corresponding disk inode to keep it in sync. When the file corresponding to a particular inode has no more open references, that inode is put on the free list so that it can be reused.

The problem with the inode table is that even when an inode isn't "in use" by anything on the system, it is still referenced by the DNLC (directory name lookup cache). Each time a single reference is made to a new file, and that file's inode information is added to the inode table, a reference is made in the DNLC so that subsequent references to the same file can be resolved quickly, without going to disk.

When something is referenced by the DNLC, that inode's vnode's in-core reference count is incremented by one. So, when a file is being used by only one *open()*, its in-core reference count is 2, one for the original reference and one for the DNLC reference. The DNLC is maintained as a "least recently used" (LRU) chain, so that the more frequently something is referenced, the further toward the end of the list it will be.

Generally, the inode table is kept mostly full as a result of the DNLC references: unless an inode is marked invalid directly, there is always a DNLC

reference to an in-core inode. When the system needs to allocate a space in the table for a new inode, it first looks for a genuinely unused table entry. If none is available, the first DNLC reference on the list (the file that has gone the longest without a reference) is purged, and if that decrements that inode's in-core references to zero, it leaves space in the inode table to put something new. If that purge doesn't free anything, then the next DNLC entry is purged, and so on.

If everything gets purged from the DNLC, and there is still no free space, then there is a reference to everything in the inode table even without all of the DNLC references, causing the "inode: table is full" message on the console.

Because of these DNLC references, the information reported by the tools as "the number of inode entries in use" is usually quite high, since here "in use" could also mean in use only by the DNLC. In order to count the number of entries in the inode table that are not referenced by anything besides the DNLC, one needs to scan the DNLC's LRU chains to see what has more than one reference. Any inode referenced only by the DNLC will be available if that entry is purged from cache. Currently, this requires writing a program to examine the running kernel.

Until a better tool is available for HP-UX to examine the inode table for capacity, it is usually a good idea to have the *ninode* parameter track the *nfile* value. *nfile* is the maximum number of all files open at one time while *ninode* limits the number of "unique" files that may be opened.

In a database situation, there may be hundreds of files open at the same time,

but these files are likely the same, in which case *ninode* can be made quite a bit smaller since the unique file count is low.

Q: How can I determine the speed of my computer?

A: For the PA-RISC processors (Series 700 and 800), you can (as root) use:

```
adb -k /hp-ux /dev/mem
itick_per_tick/D
CTRL-D
```

Whatever the result is, either multiply by 100 to get the frequency in Hz or divide by 10,000 to get the frequency in MHz. Here is an example in a script:

```
MHZ=`echo itick_per_tick/D | adb /hp-ux /dev/kmem \
| tail -1 | awk '{print $2/10000}'`
```

Then, `echo $MHZ` will return the processor's speed in megaHertz. This would be helpful for the Series 700 where new models of the 700 return the same ID from *uname(1)* but have a different clock speed such as the 715/100.

Q: When a program dumps core, is there a way to LIMIT the core file size?

A: One way is to:

```
rm core
touch core
chmod 0 core
chown root core
```

in all the directories where a core file might appear. The file is zero length and cannot be removed except by root. (There is no limit mechanism in HP-UX shells at 9.0 and earlier.) However, occasionally programs run as system or root processes will still produce this type of file, so another way is to:

```
rm core
mkdir core
```

HP-UX does have a limit mechanism, but at Revision 9.0x and earlier, there is no

shell command to handle this function. The following program can be compiled and used to set the environment of the program being tested:

```
#define _KERNEL
#include <sys/resource.h>
int main(argc, argv)
int argc;
char **argv;
{
    struct rlimit limcore;
    limcore.rlim_cur = 0;
    limcore.rlim_max = 0;
    setrlimit(RLIMIT_CORE, &limcore);
    execvp(argv[1], argv + 1);
}
```

You could name the program *corenot* (or whatever) and then precede the running of the program with *corenot* as in:

```
corenot myprogram param1...
```

General HP-UX and 9000 questions are answered by Bill Hassell, a support engineer at the HP Atlanta Response Center. He can be contacted via e-mail at blh@hpuerca.atl.hp.com.

Workstations

Q: I am running BASIC/UX 7.1 on an HP 9000 Series 725 CPU. I would like to know if it is possible to configure BASIC/UX 7.1 so that the window menu button in the upper left-hand corner of the RMBUX window does not show or work. I need to prevent my users from exiting BASIC/UX through the "close" option of that menu. I want to force them to enter "quit" or "bye" in the BASIC/UX window for a clean exit of BASIC/UX.

A: Yes it is possible to configure the BASIC/UX window so that the menu in the upper left-hand corner of the RMBUX window does not show and is not active. However, this is not a function of BASIC/UX but a function of the window manager. The window manager controls many of the resources

used by the windows it manages. To set up a BASIC/UX window with the menu in question removed, do the following:

Edit the */usr/vue/app-defaults/Vuewm* file and add the line:

```
Vuewm*Rmb*clientDecoration: title
```

Resave the file with the changes and then restart the workspace manager.

Now when you run BASIC/UX, your window will be minus the menu and borders; only the title bar will show. To get an explanation of the *clientDecoration:* resource, do a man on *vuewm*.

Q: I am running HP-UX 9.05 and MPOWER 2.02 on an HP 9000 Series 712 workstation. My HP 712 is the MPOWER server and fax server for my group. I am experiencing a problem with the FAX 9000 part of MPOWER. My problem is that the current version of the fax software truncates all text past 78 characters and we need to send files with lines that are 80 characters long. Is this normal for MPOWER's fax? Is this a bug and is there a fix?

A: This is a bug with MPOWER 2.02's FAX 9000 Version 1.4 and will be fixed in the next version. The problem is that the indent value was changed at Version 1.4, which resulted in the truncation to 78 characters. To correct this behavior we can reset the indent value by editing a file in the */usr/fax/convert* directory as follows:

Edit the */usr/fax/convert/ascii* file and search for the following line:


```
asciitiff -q $RESOLUTION $CONVARGS -o $OFIL $IFIL
```

Edit the line to read:

```
asciitiff -q $RESOLUTION $CONVARGS -i 0.2i -o $OFIL $IFIL
```

The *-i 0.2i* will change the indent value from .5 to .2, which will prevent the truncation to 78 characters. This fix will be included in the next release of MPOWER's FAX 9000.

Q: I just received the latest revision of HP's SICL product. I am running the new SICL 3.06 on an HP 9000 Series 715 at HP-UX 9.05. I loaded it on my 715, which does not have an



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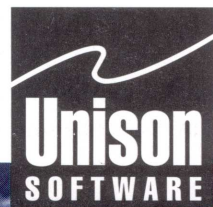
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CIRCLE 72 ON READER SERVICE CARD

HP-IB interface, to take advantage of the LAN-to-HP-IB gateway services included in SICL 3.x. I have experience with SICL from setting up an E2071B card on an HP 9000 Series 725 that we equipped with SICL earlier. My problem is as follows: I followed the directions on setting up SICL. I copied the default *hwconfig.cf* file to the */usr/pil/etc* directory; I then edited the *hwconfig.cf* file and uncommented the line that referenced the LAN. Finally I ran */usr/pil/bin/pilconf* to rebuild the kernel to include the *pil* driver. But the *pilconf* utility failed. It returned the following string and did not rebuild the kernel as I expected:

```
Reading HW configuration file
/usr/pil/etc/hwconfig.cf.
No cards were found in /usr/pil/etc/hwconfig.cf file!
```

Did I miss something in the configuration? Why does *pilconf* fail?

A: No, you did not miss any steps in the configuration. The LAN-to-HP-IB gateway capability requires that you uncomment only the following line in the *hwconfig.cf* file after copying the file from */usr/pil/defaults* directory to the */usr/pil/etc* directory:

```
30 lan ilan 0 0 120 25
```

The */usr/pil/bin/pilconf* utility was correct in the fact that it found no interface cards uncommented that required the *pil* driver to be added to the kernel. The LAN-to-HP-IB gateway functionality does not require the *pil* driver in the kernel, so the rebuild was not necessary. You simply edit the file and run the *pilconf* utility.

Q: I am running BASIC/UX 7.1 and HP-UX 9.05 on an HP 9000 Series 712 CPU. I only installed BASIC/UX 7.1 recently on the 712 workstation to take advantage of the new LAN-to-HP-IB gateway feature. However, after configuring SICL and editing my */usr/lib/rmb/rmbrc* file and adding the following line:

```
INTERFACE 8 = "lan[hplibhost]:hpib"; NORMAL
```

where *hplibhost* is the node name of an HP E2050A LAN-to-HP-IB gateway, I receive the following errors when I run

BASIC/UX 7.1 by executing the *rmb* command:

```
ilan<> Error 22, lan_connect() failed
ilan<> Error 22, unable to setup connections to server
```

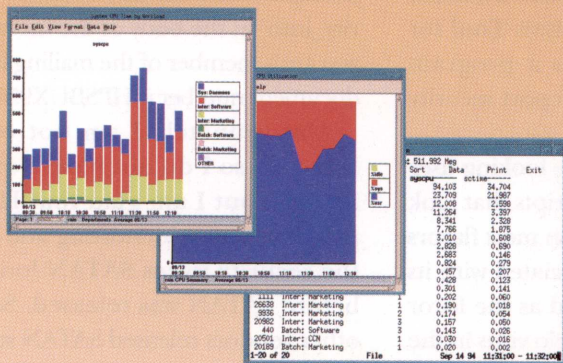
Did I misconfigure something? Why am I seeing these errors?

A: No, you did not misconfigure BASIC/UX 7.1. The SICL error 22 means "not implemented." This is explained in the latest *HP BASIC Interface Reference* in Chapter 11 titled "The HP SICL/LAN Interface" in the paragraph titled "LAN Effects on BASIC/UX Behavior." The manual explains that these errors can be ignored. They do not indicate the failure of all LAN operations. The errors result from the fact that one LAN-to-HP-IB gateway box does not support non-controller HP-IB operations. When BASIC/UX attempts to enable this mode, the gateway prompts the error message. ■

Rudy Stanley is an applications support engineer with the Hewlett-Packard Response Center in Atlanta, Georgia. He can be reached via e-mail at: brst@hpuerca.atl.hp.com.

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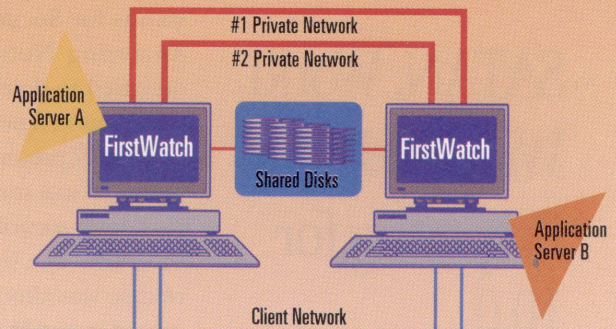
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CIRCLE 54 ON READER SERVICE CARD

by Chris Curtin

SATAN, World Wide Web, and Preparing for 10.0

I HOPE YOU ARE READING this column sitting in the sun by the pool (or by a warm fire in a ski lodge somewhere for our Southern Hemisphere readers), but I am writing this on Tax Day, April 15th.

As you have probably read, SATAN was released on April 5th to anyone and everyone on the Internet. SATAN, which stands for **Security Analysis Tool for Analyzing Networks**, is a program designed to detect and report security problems in a network.

SATAN presents a nice looking user interface to a series of scripts that look for known security holes in most flavors of UNIX. The hype associated with its release was almost as bad as the furor caused by the Michelangelo virus in the MS-DOS world a couple of years ago.

SATAN scared a lot of people, including me, when it was first announced. The first reports about it listed it as a cracker's dream tool that would identify holes for crackers to exploit to break into a system, even systems with firewalls and other security measures. Of course the first reports emerged a couple of weeks before the software or the documentation was available! Slowly reports began to appear that the tool would identify only known security problems, for many of which patches are available from the various vendors. Then HP did something extremely proactive: On April 4th they sent an HP SupportLine Mail Service Notice to their *security_info* mailing list, detailing the attacks SATAN would attempt and the responses/patches needed for HP-UX systems, beginning with HP-UX 8.0. If a patch did not exist for a hole, they described a workaround that could be used until one was available. (The workarounds usually meant disabling or not using a service, but at least you knew what the issues were!)

How did I get this notice? HP sent it to me. I joined the *security_info* mailing list when it was created about a year ago. The list was started when the CERT organization began producing bulletins of known UNIX security holes. To join the list: send e-mail to support@support.mayfield.hp.com and include 'subscribe security_info' in the body of the message. If you are a member of the mailing list, the document number is HPSBUX9504026.

Unfortunately I am not on the Internet, so I do not have a copy of SATAN, but I am glad that HP was proactive about identifying and fixing the security issues SATAN looks for before SATAN was released. Several other vendors released SATAN security bulletins the same day that SATAN was released or a couple of days later!

The Notice also included some very valuable information about HP security: If you would like to receive all the bulletins to date, send a message to support@support.mayfield.hp.com and include 'send security_info_list' in the body of the message.

To get a list of all security-related patches, send a message to the same address with 'send hp-ux_patch_matrix' in the body of the message. You can subscribe and obtain the bulletin list and the patch list in one message; just place each request on its own line.

If you are on the Internet and have not heard about SATAN or HP's security patches, call HP right now. Don't finish this column, call HP now. Although SATAN doesn't do any outright damage, a smart cracker can take advantage of what it finds in minutes.

Reader Survey

Late last year Interex performed a survey of a group of *hp-ux/usr* readers

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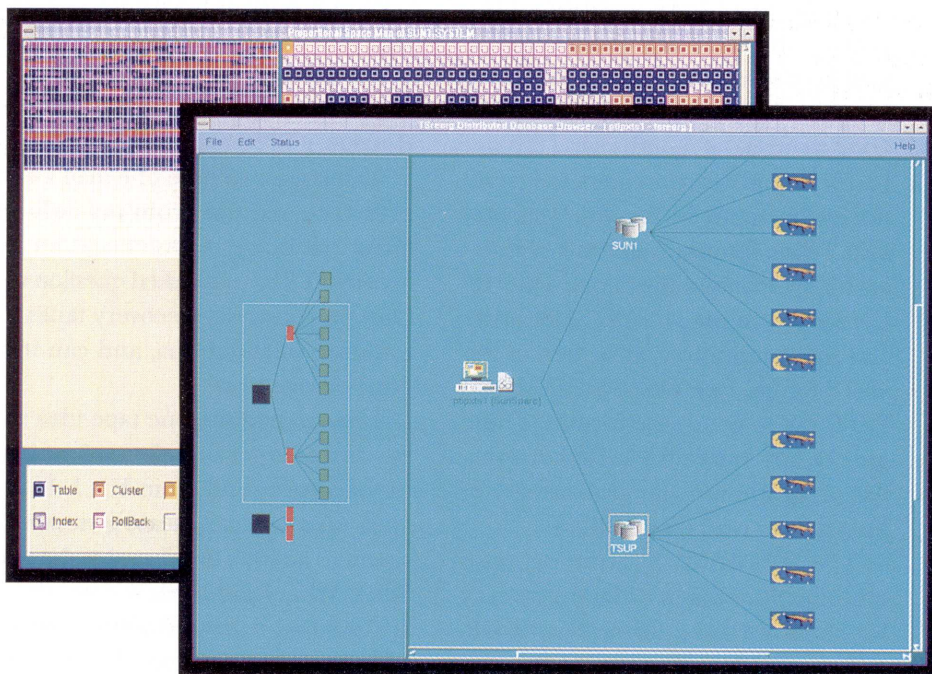
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asking them, among other things, the columns they liked to read and the improvements in the magazine that they would like to see. I am proud to announce that 88.5 percent of the respondents listed my column as their favorite. Thank you all very, very much!

The number one improvement requested was for information about HP-UX patches. Since installing patches is typically a system administration function, I have been thinking about ways of doing this. Generating a list of patches released between issues is one idea, but the time between the writing of the articles and their publication is usually three months. In that time a lot of patches become obsolete.

HP has several mailing lists, such as the *security_info* list, specifically for HP-UX patches. I receive the list for the Series 700 and 800 and usually get it every Monday or Tuesday morning. It gives a description of each of the new patches in a contents section and then the bodies of the patch text. Each list also includes a description of how to obtain these patches.

For information about the HP mailing lists, send a message to *support@support.mayfield.hp.com* and include 'send guide.txt' in the body. You will receive a *User's Guide* to the mailing lists and descriptions of how to join one or more of the lists.

If anyone has other ideas about how to get the patch information out to the installed base, please send me some e-mail. My address is printed below. I will make sure the ideas get to the editors and to HP if necessary.

World Wide Web

One of the new features of the magazine is a WWW page containing articles

and columns from past issues. Check it out at <http://www.interex.org/hpuxusr/>. Since I do not have Internet access, I have not seen it yet, but the September 1994, November 1994, January 1995, March 1995, and May 1995 issues are available.

CompuServe HP SYSTEMS Forum

While I do not have direct Internet access, I do have a Usenet news feed. In past columns I have mentioned the *comp.sys.hp.** hierarchy and received e-mail from several readers who suggested I look at the forums on CompuServe. Until a couple of months ago I did not have a CompuServe account, so I could not comment on the forums. Well, now I do. I have found two forums of interest for system administrators. The HP-UX section in the HPSYSTEMS forum and the Administration section of the UNIX forum. Type *GO HPSYSTEMS* and *GO UNIX* to get to the forums. These are not free, but with WinCIM or a similar program, you can grab articles of interest and read them offline.

The HPSYSTEMS forum contains other sections about different types of HP hardware and software, but the HP-UX area is the most interesting for administration. It is staffed by a couple of good sys-ops and most questions posted are answered fairly quickly. Unfortunately I have yet to see anyone from HP answer any questions, but they may not be identifying themselves as HP employees.

One nice feature of CompuServe is its libraries. Every couple of weeks someone uploads the HP-UX patch list to the library as well as some HP press releases about HP-UX. The libraries have full search capabilities, so looking for a description of a patch or a problem

is pretty easy.

The Administration section of the UNIX forum is useful for general administration discussions, but most HP-UX questions asked are sent over to the HPSYSTEMS forum. If you are using Linux at home, or at work, the UNIX forum has a very large group of Linux users and administrators.

Though I can be reached at my CompuServe account, I check messages only once or twice a week. A message sent to the address below will get to me quicker.

Recovery Tape Revisited

The largest volume of e-mail I have ever received was from my column about creating a recovery tape for the Series 700. The most asked question was, How do you create recovery tapes for multiple workstations, and can it be done on one tape?

I researched the one tape idea and was unable to get any information about the *mkrs* program from HP. I do not know what format it uses to generate the system or how it is transferred to the tape. Sorry. What I did learn is that HP-UX 10.0 will have a new recovery system that addresses some of the problems with the 9.0 *mkrs* script, including Series 800 support. More on that when I get 10.0.

Preparing for HP-UX 10.0

Be sure to read Bill Hassell's cover story on HP-UX 10.0 in this issue. It gives a good overview of the features of Version 10.0. I was hoping to have a column about HP-UX 10.0 at this time, but my update has not arrived yet. What I am doing, and so can you, to prepare for 10.0 is to look at books for other UNIX versions based on AT&T UNIX. Starting with 10.0, HP is moving away from its

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One book to look at, which I reviewed in the last issue, is *The Unix System Administration Handbook*, Second Edition, ISBN 0-13-151-51-7 published by Prentice Hall. This book covers the 9.0 version of HP-UX and versions of DEC OSF/1, Sun's Solaris, and SGI's IRIX. Much of what is said for vanilla AT&T releases will apply to 10.0.

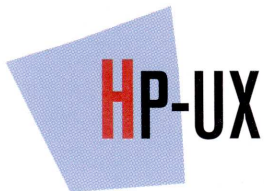
Keep the comments and suggestions coming and thanks again for reading. ■

Chris Curtin, a software developer for Bradley Ward Systems, Inc. in Atlanta, Georgia, specializes in device driver development for factory automation on the HP 9000. He can be reached via e-mail at: chris@bwilab3.atl.ga.us.

CIRCLE 140 ON READER SERVICE CARD

hp-ux/usr ■ july 1995

19



by David Totsch

Loitering

COMPUTERS ARE WONDERFUL THINGS. They are so efficient at doing one thing really fast that we tend to believe in the illusion of multi-user. They perform so well at this chicanery that we begin to give them more than one task to perform at a time because it is faster than performing tasks in a linear fashion. On occasion, you even find yourself wanting to have a shell script perform multiple tasks concurrently.

The immediate solution is to have a shell script spawn off several concurrent processes in the background. The problem lies in determining whether or not those tasks were performed successfully. Occasionally you have the added requirement that a subsequent process relies on the proper completion of processes you placed in the background.

You can have a shell spawn several background processes by following commands with `&`. This will make the machine pleasantly busy looking as if it were doing more than one thing at a time. Now you need to know the exit status of each process you have backgrounded. If you write a function for your shell that monitors the process you want to run and captures its exit status, you can put calls to that function into the background. Here is a code fragment that illustrates such a function call:

```
LOG=/usr/tmp/backuplogs

RUNBACKUP()
{
/etc/fbackup -f ${1} -${BL} -u -g ${2} -I ${3} >
${LOG}/${1}_${2}

ESTATUS=${?}
}

##### MAIN

INDEX=/usr/adm/fbackupfiles/`date +%b%d.%H%M`
GRAPH=/usr/adm/fbackupfiles/graphs/full

for I in 0 1 2
do
    RUNBACKUP /dev/rmt/${I}m ${GRAPH}${I} ${INDEX}_${I} &
done
```

This code fragment spawns an *fbackup* for each of three tape drives. When each individual backup process is finished, the exit status of *fbackup* is stored in `$(ESTATUS)`. It is left up to the reader to capture these status values for an overall exit status. Just remember that this will be a background process and therefore a child process, so you will not be able to use variables.

Now that the exit status of each concurrent process can be captured, the requirement of dependent processes becomes attainable. When the shell puts a command into the background, it continues on, looking for the next command to execute. We

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CIRCLE 53 ON READER SERVICE CARD

need a way to tell the shell to remain idle until all of the background processes have been completed. The shell command *wait* will tell the shell to perform just this kind of loitering.

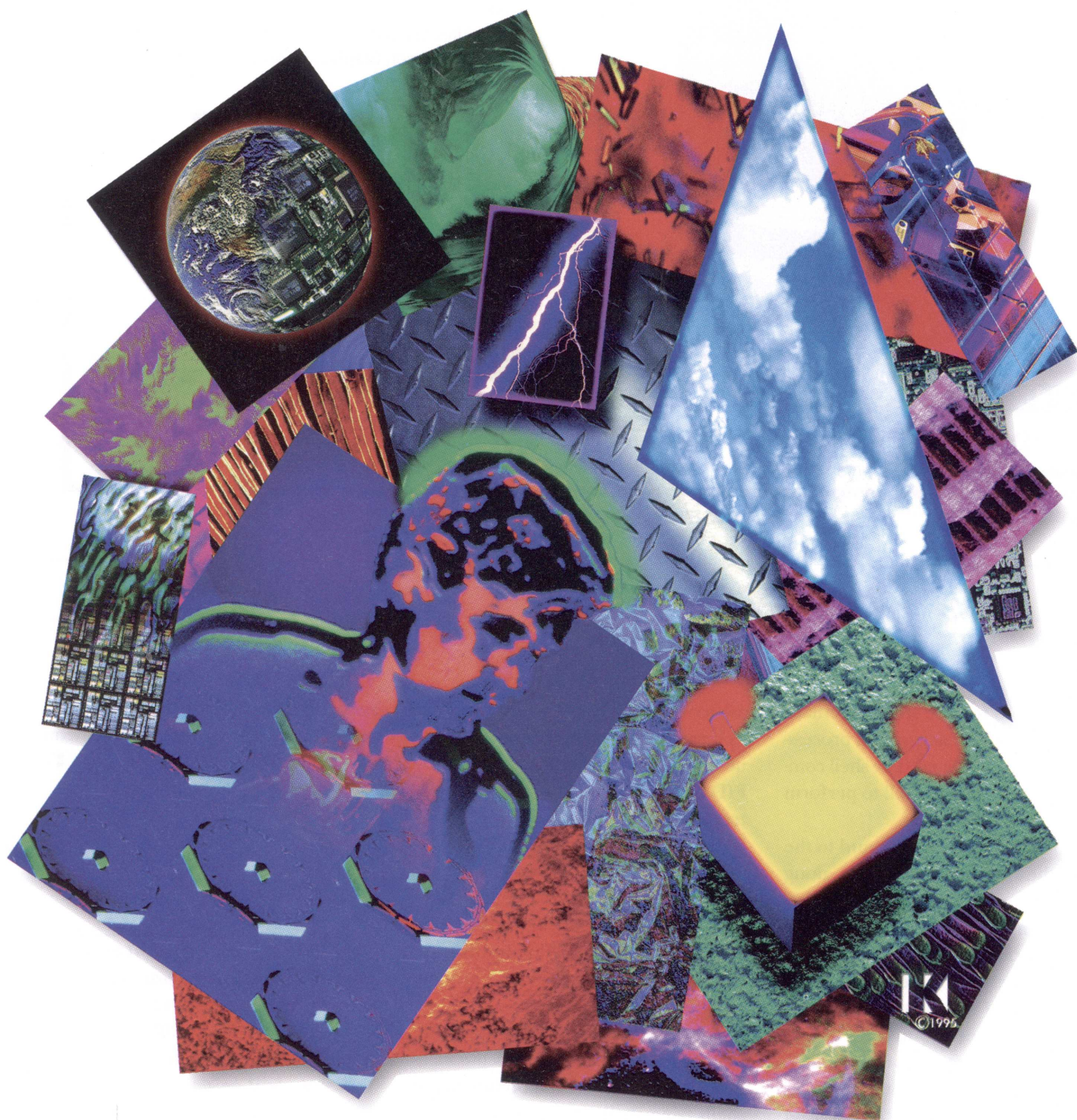
If you add the *wait* command to the end of the code fragment above, along with your mechanism for cumulatively capturing *ESTATUS*, you can then make a decision on performing post-backup processing. By default, *wait* will loiter on all of the outstanding background processes. If you want to wait on a particular process, you will need its process id (PID). If you wait on an individual PID, the exit code of *wait* will be the exit code of the PID it was waiting on. Although, this status can yield unreliable results if there is more than one background process. If you

ask to wait and all background processes have finished, the shell will continue as expected. If you wait on a specific PID that is not part of your process tree, the exit status of *wait* will be 127. If you wait on a specific PID that was part of your process tree and has already been completed, the exit status is unreliable. The safe route is to have *wait* do the waiting and capture the exit status of your background processes in another manner.

As you explore the *wait* command, note that its behavior for interactive shells is slightly different from non-interactive shells (your shell scripts). As always, you will want to consult documentation. Note that there is a man page on a *wait(1)* command. The *wait* we have been discussing is a part of the *shell*. You should

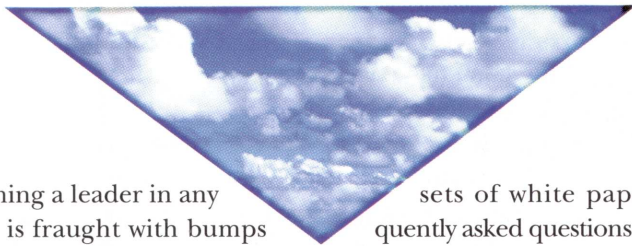
read the man(1) page of the shell you program in (although they all behave in a similar fashion). ■

After serving several different organizations over the past seven years as a system administrator with various flavors of UNIX, David L. Totsch still enjoys the profession. He also enjoys discussing UNIX with just about anyone. At present, he is working with HP-UX systems and wide-area networks for a Fortune 100 company in the Piedmont area of North Carolina. He can be reached via Internet at dtotsch@wfu.edu.



First Looks at

release 10.0



becoming a leader in any field is fraught with bumps and pitfalls, and yet to remain static is to lose ground in the rapidly changing world of computers and software. Such is the nature of the computer biz and with a great deal of courage and pride, HP is now shipping HP-UX Version 10.0. Many of the new features in 10.0 are in direct response to requests from the Interex community for enhancements and standards conformance and, indeed, 10.0 represents the largest number of changes ever incorporated in a new release for HP-UX.

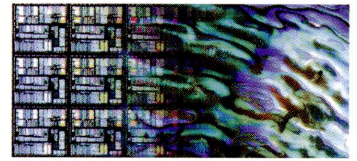
The most notable changes for current users of HP-UX are the new locations for files and some file name changes, the replacement of *update(1m)* with the Software Distributor utilities, and the convergence of 700 and 800 code for consistent system administration. And with the many changes in 10.0, HP is providing new and enhanced support services to aid in the update tasks.

Unique to the 10.0 release are the

sets of white papers and frequently asked questions (FAQs) available from HP's Support Line as well as through the Response Center. These papers cover such topics as the new file system layout, using the Software Distributor, and how to use the conversion tools before updating to 10.0. In keeping with the worldwide growth in the use of the Internet, 10.0 information is available through HP's World Wide Web (WWW) home page at <http://www.hp.com>, or more specifically: <http://support.mayfield.hp.com>. In addition to these online documents, many documents will be found in the 10.0 file sets under the directory: */user/share/doc*, including the 10.0 Release Notes.

Release Strategy

For 10.0 to be successful for everyone, there had to be two releases, one called the New Business Release (NBR) and a second called 10.01, or the General Business Release (GBR). The New Business Release gives early adopters and Channel Partners a chance to make and review the changes that



may be necessary in existing software packages. And with the release of 10.0, several new computer models are now available that make use of features designed into 10.0.

New systems such as the Series 800 K-class computers will require 10.0 and are ideal candidates for new projects and installations where software development will be the primary task. As with any major change in an operating system release, proper planning is the key to success and HP is dedicated to providing the support necessary to achieve this success. Included with the 10.0 Release Notes is a set of guidelines for writing portable applications, which will be of interest to developers and HP Channel Partners.

With 10.0, HP-UX converges both the Series 700 Workstations and the Series 800 Business Servers so that very few differences will exist between the two environments. HP-UX programs found previously on one platform but not the other will be a thing of the past and system administrators will welcome the same set of kernel generation tools.

File System Changes

Most visible of all the changes for 10.0 are the new locations for files and a few changes to actual file names. Note that this is not a change to the underlying structure of the HFS file system, but a change in the names and purposes of many directories. While this might appear to be a significant change to the existing file placements, there have been a number of problems with the previous definitions and usage of various directories.

Consider the problems associated with pre-10.0 directories. */usr* is the largest directory in a standard HP-UX installation, containing such things as:

- (a) Print spooler files (*/usr/spool/lp*)
- (b) e-mail (*/usr/mail*)
- (c) log files (*/usr/adm*)
- (d) uucp files (*/usr/spool/uucp*)
- (e) libraries for programs (*/usr/lib* and */usr/include*)
- (f) application programs (*/usr/app_name*)
- (g) HP-UX programs (*/usr/bin* and */usr/lib*)

Of the items above, a, b, c, and d are very dynamic in size, often varying tens of megabytes at various times, while items e, f, and g are generally static and contain fixed files and programs. Many of the operating system programs, such as networking and spooler tasks, write to the log files in */usr/adm*; filling the */usr* file system can lead to a series of system problems.

Therein lies the primary reason to adopt a more consistent, task-oriented file system layout. By moving highly variable and dynamic directories to a different location, static directories can remain on dedicated mount points with stable size constraints. Refer to *Figure 1* for the general philosophy of the new layout.

The 10.0 file system layout is similar to OSF/1 and SVR4 layout. Several features of this new layout make a system easier to administer:

- Files are organized by function or category, e.g., highly variable or dynamic files and directories, versus static categories containing programs and configuration data files.
- HP-UX files are kept separate from applications on the system, and within an application, those files are kept local rather than scattered throughout the file system.
- Startup configuration has been moved from heterogeneous files such as

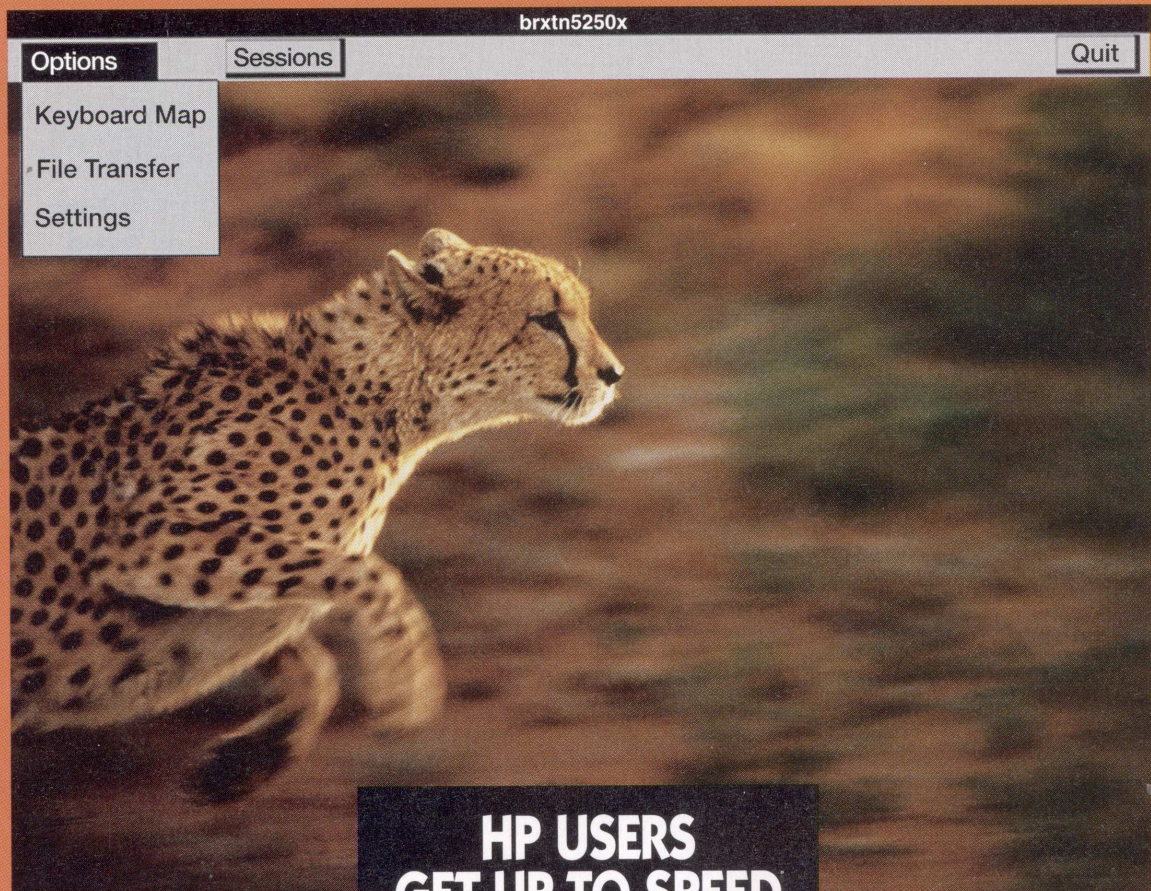
/etc/rc and */etc/netlinkrc* to a configuration directory from which specific HP-UX command(s) are called to perform the task(s).

- Log files are kept separate from temporary files and other configuration files.

Although there are some minor variations between various manufacturers of V.4 systems, HP-UX conforms closely to industry standards for SVR4 and OSF/1. Here are some notes about *Figure 2*, which illustrates the file system layout.

- */etc* is exclusively configuration data—no programs.
- */tmp* is a private directory where HP-UX temp files are found.
- Applications are now in */opt* rather than */usr*.
- */usr*, */sbin*, and portions of */opt* (applications) are defined as shareable among networked systems and must not contain host-specific files.
- Host-specific files must be kept in private directories such as */etc*, */var*, */tmp*, and */stand*.
- */home* is the starting point for all users' home directories.
- NFS shareable directories now start in */export*.

Application programs are now mapped using a standard method similar to */usr*'s mapping. In this design, an application has self-contained directories with all related files in directories such as *bin*, *lib*, *share*, and *newconfig*, and share the same philosophy as */usr*. Thus, all application executables will be "found in */opt/<application>/bin* while related libraries are found in */opt/<app>/lib*. *Figure 3* illustrates this approach.



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FIGURE 1 *File System Layout Philosophy*

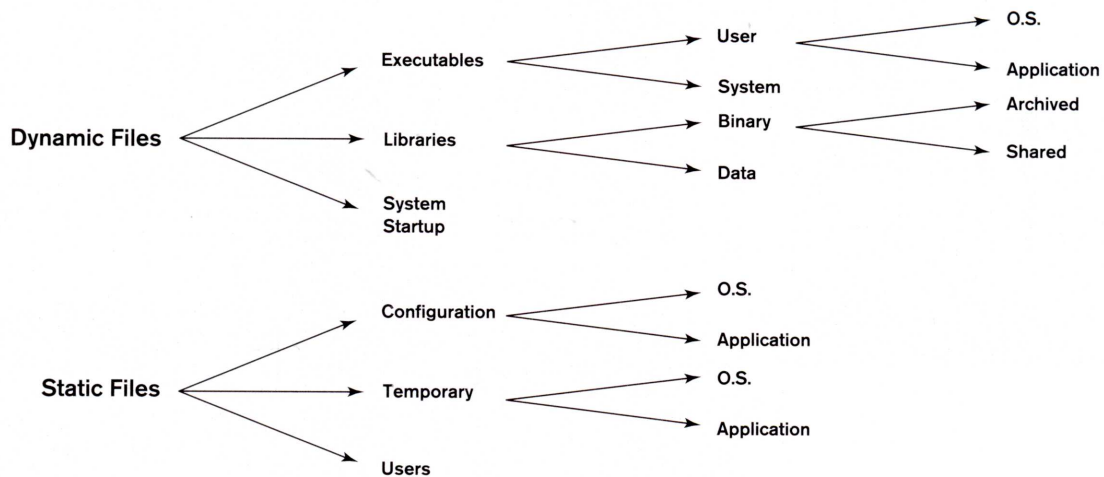
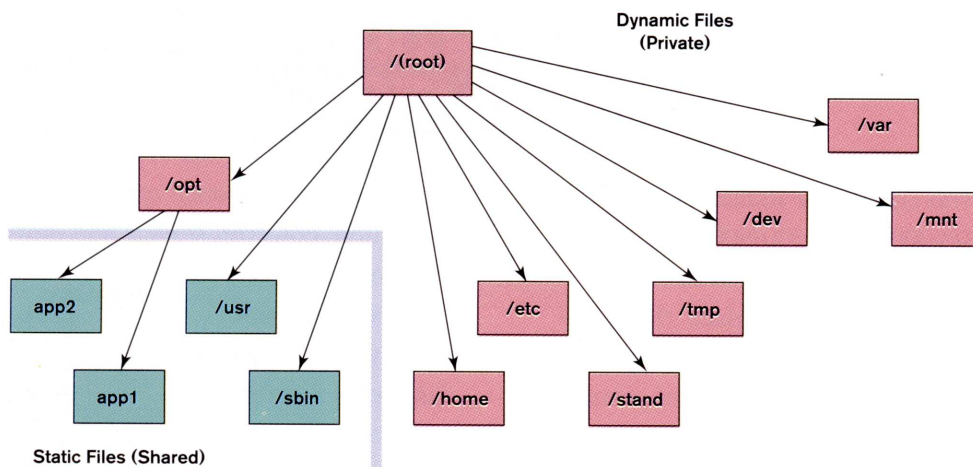


FIGURE 2 *New Layout Diagram*



A fairly complete list of directories appears in the **HP-UX 10.0 Directory Definitions** card at the end of this article. You may wish to tear out this card and keep it handy for the next several months as a guide to the directory changes and design goals.

System Startup Overview

Incorporating the OSF/1 startup/

shutdown model, HP-UX 10.0 makes several advances in the area of system administration and updating. In past revisions, important system configuration scripts such as `/etc/rc` and `/etc/netlinkrc` were often bottlenecks in an otherwise smooth update process. Changes made to these important scripts are usually undocumented and long forgotten by system administrators,

which means extra time is required to troubleshoot an update.

In the new model, scripts that perform the required tasks for both startup and shutdown are kept separate and unmodified in `/sbin/init.d`. These scripts are each limited to a single task such as starting `sendmail(1m)` or the spooling subsystem. To control the behavior of the execution scripts, a set of configuration

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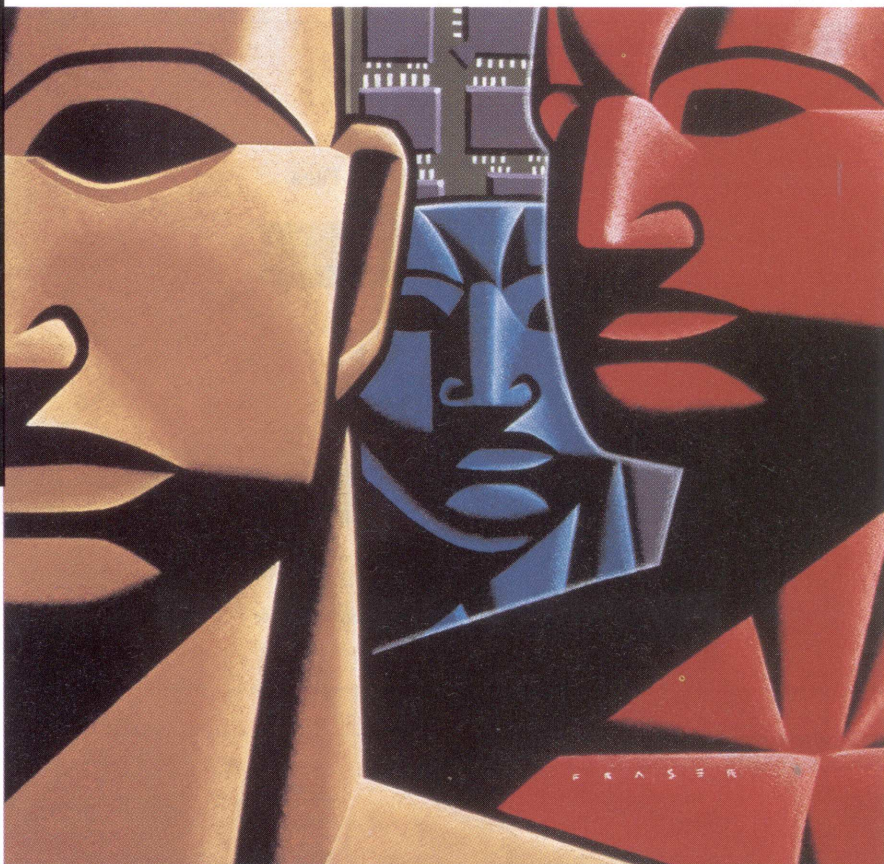
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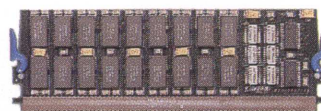
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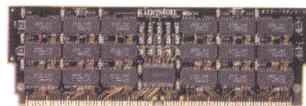
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32MB, 64MB, 128MB, 256MB



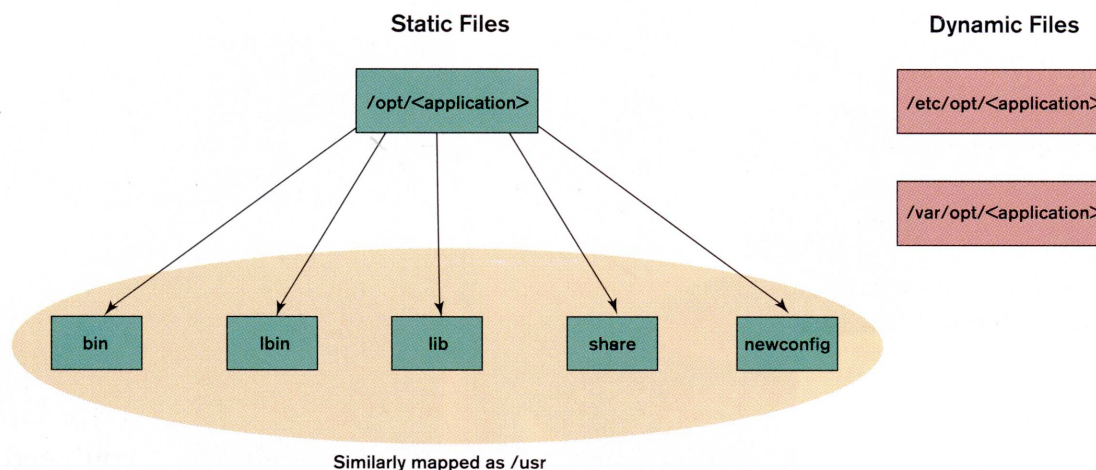
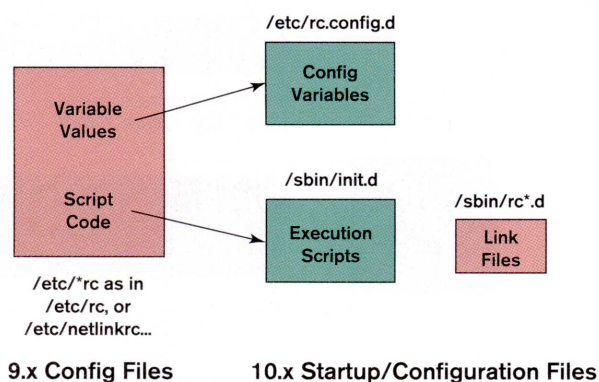
HP/Apollo Series 9000 Model 750, 755 Memory
32MB, 64MB, 128MB



Challenge™ & Onyx™ Memory
64MB, 256MB



SPARC System 10 Memory
16MB, 64MB

FIGURE 3 Application Directory Layout**FIGURE 4** Startup Scripts, 9.x vs 10.0

files corresponding to each execution script is stored in `/etc/rc.config.d`, with a name that is generally equal to that of the execution script. To further control the startup process, the configuration scripts are linked to names in the directory `/sbin/rc*.d`, where `*` is the init level 0, 1, 2, etc. Refer to Figure 4, which shows 9.x versus 10.0 configuration scripts.

Be sure to look at the Release Notes as well as the 10.0 manual set concerning the startup/shutdown scripts. The

new style, while different, is actually much simpler to control, avoids conflicts during updates, and clearly separates the tasks of startup and shutdown.

Run Levels

Starting with 10.0, run levels are clearly defined as to their stated purpose and a paradigm is documented to aid system administrators in configuring each init state. In Table 1 you will see the 10.0 definition for each run level as

well as the controlling directory, called a sequencer directory. Simply stated, each *sequencer* directory contains the names of the scripts to be run in a specific run state, with an embedded sequence number to control when the script is to be run.

In addition to better definitions of the run levels, run levels 1, 2, 3, and 4 have defined paradigms for the sequence of events and categories for startup and shutdown tasks (see Table 1). For run levels 0 and S, all shutdown or startup scripts are executed, regardless of the current run level. For run levels 1 through 6, all startup scripts are executed when moving to a higher level, and all kill scripts are executed when moving to a lower level. The white papers entitled "HP-UX 10.0 File System Layout" and "HP-UX 10.0 System Startup" have additional details concerning the startup and shutdown scripts.

Transition Tools

Recognizing the need for a smooth transition to 10.0, HP has developed a series of automated tools to aid in the update and planning process. To make the move to 10.0 even easier, all of the transition tools will run on 9.0x systems.

One of the most useful of these tools is a program to create a set of transition links that point from the new 10.0 file system layout to pre-10.0 path names. These links allow software that has been hardcoded with 9.0 path names to continue running on a 10.0 system. These links may be installed or removed with a simple command.

Can you remember all the scripts and programs you wrote that have hardcoded path names? Neither can I. To aid in the transition, several tools have been created to address this common dilemma. The first is *fullookup(1)*, which provides a translation service between the two file system layouts. You can request a 10.0 name for a 9.0 file and, likewise, a 9.0 file name for a 10.

Now, going through hundreds of scripts and program source code by hand and making the changes is not going to be easy, but with *analyze(1)* and *prepare(1)*, most of the task can be completely automated. *analyze(1)* has the ability to find pre-10.0 path names and file name references in most programming languages, shell scripts, and man pages, even your own documentation, providing a report on the changes needed for each file. Optionally, *analyze(1)* can even make the changes automatically.

prepare(1) is an automated tool to drive the *analyze(1)* program, since the task of converting a large development system might be formidable even for the best script writer. *prepare(1)* is a front-end batch program to help categorize and automate *analyze(1)* tasks.

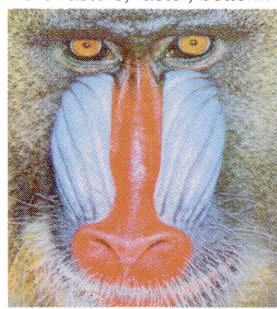
SAM Enhancements

Administrators of HP-UX systems have been looking for ways to delegate subsets of the administrative details to

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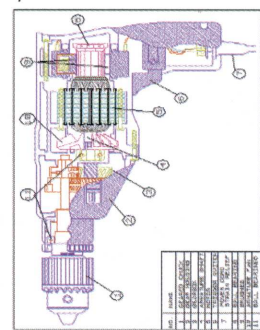
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TABLE 1 *Init States for 10.0*

RUN LEVEL	STATE	SEQUENCER DIR
0	halted	/sbin/rc0.d
S	Single User	/sbin/rc0.d
1	Minimal System Configuration	/sbin/rc1.d
2	Multi-User	/sbin/rc2.d
3	Exported File Systems	/sbin/rc3.d
4	HP-VUE	/sbin/rc4.d
5,6	(not currently used)	/sbin/rc5.d /sbin/rc6.d

coworkers and even to users themselves. At 10.0, SAM has made considerable progress toward simplifying the administrator's tasks and one of the ways is to allow nonroot users to run portions of SAM. These features are configured by root and can include limitations on the scope of a task (for example, mounting a file system such as a floppy or CD-ROM). Root can confer such privileges on a per-user basis.

In addition, some of SAM's more common tasks, such as adding and removing a user's account, have been enhanced by the provision of HP-UX commands for administrators who need to automate the process. In the past, the scripts used by SAM, such as *addusr*, were not well documented and were subject to change without notice. Now these tasks are documented HP-UX commands, and adding or deleting 100 or even 1,000 users can be done with a script. SAM also allows easy-to-use password aging specifications.

Logical Volume Manager

LVM has been a part of Series 800 Business Servers since 9.0, and now at 10.0, LVM is part of the Series 700 workstation environment. With LVM, the disk can be divided more equitably between file systems, swap areas, and raw partitions. Some file systems may even be extended when space is available, thus minimizing the need to back up a file system, lay out the new sizes using *newfs*,

and then reload the files. LVM allows large disk drives to be partitioned into 4-GB sections for HFS volumes.

In addition, LVM now has built-in commands to perform disk striping on both Series 700 and 800 systems. LVM also offers dual path I/O to allow additional redundancy for reliability. Series 800 users should be aware that hard partitions, while still supported at 10.0, will have a number of restrictions, and in addition section 2 (the entire disk for pre-10.0 Series 800s) is now known as section 0 as part of the 700/800 convergence.

Password Features

HP-UX 10.0 is security level C2-compliant, with some additional capabilities found in B1 level. Although password aging has been available in earlier revisions, the cryptic characters in the password file were anything but friendly, leading many administrators to ignore password aging.

In a well-managed HP-UX system, all users should be required to change their passwords on a regular basis and new passwords should not be allowed to be changed until a minimum time has elapsed. With 10.0, password screening can be enforced to require users to choose passwords of a certain length or require numeric digits, etc. To enhance security further, a password generation program is included along with login restrictions, such as time-based login (cannot log in during certain hours),

and location-based restrictions, such as log in from a specific terminal.

System administrators who have been using the */.secure/etc/passwd* file will need to read the sections on the shadow password file in the Release Notes. When a system is converted to a secure system via SAM, a file is created for every user in the */etc/passwd* file. This file contains information on password aging, maximum number of retries allowed, password length restrictions, times of the day allowed for logins, etc. Note that converting a system to secure will prevent that system from being a part of an NIS domain.

NFS Diskless

HP pioneered the diskless, or DUX, design many years ago with a proprietary protocol that had a number of desirable features. While quite powerful and efficient, the DUX protocol was nonstandard, and as systems continued to grow into heterogeneous environments, the need for an industry-standard protocol was evident. NFS diskless will be the replacement for HP's DUX protocol, thus simplifying the vendor-unique administrative tasks associated with diskless workstations. NFS diskless also will permit workstations to boot and run over routers in a large network. Migration from DUX to NFS will be aided with tools provided after the General Business Release.

Other Features

■ One of the most important features of the 10.0 release is the ability to continue running programs from pre-10.0 systems without the need to recompile. Other than possible changes in the source code due to path names that changed at 10.0, most application programs will run without changes

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since the core operating system code for running programs remains essentially unchanged.

- Device file names now conform in both Series 700 and 800 platforms and these names are more meaningful as to the function of the device file. Some driver names have changed, e.g., *parallel* (now called *centif*) and *autoch* (now called *ssrfc*), but these are covered in the Release Notes and documentation both on LaserROM and in paper format.

- The default shell changes from Bourne (*/bin/sh* on pre-10.0 systems) to the POSIX shell, which is quite similar to the Korn (*/bin/ksh*) shell but with better security for root users. Included in the 10.0 Release Notes is a comparison list between the Korn shell and POSIX shell.

- Memory Page Deallocation is a new feature at 10.0 that allows parity errors in memory to be bypassed rather than bringing the entire system down. When an uncorrectable error is detected in memory, a page deallocation table entry is created and the 4-KB page containing the error is removed from usable memory. Any process or function using this area will be terminated but the operating system will continue to run. Some of the newer processors remember deallocation entries after a system reboots.

- Memory-mapped files and semaphores are provided with 10.0. File policies for memory-mapped files are simple: Up to 16 pages can be obtained per I/O, even for random access. The 10.0 HFS and NFS file systems have enhanced pagein/pageout paths where I/O is tuned for less I/O on random access as compared with sequential I/O.

- Dynamic Buffer cache is now a feature on both Series 700 and 800 computers. Specifying a value for *nbuf* or *bufpages* will configure a fixed cache, while not specifying these values will create a dynamic cache. The kernel parameters *dbc_min_pct* and *dbc_max_pct* control the size of the dynamic cache.

- Software Distributor is a powerful replacement for the *update(1m)* program and makes the management of software packages significantly easier than the old file set concept from *update(1m)*. Patches can also be handled in a much simpler manner.

- For networking, the nameserver fallback feature has been rolled into 10.0. In the past, *resolv.conf* (used for nameserver inquiries) would inhibit queries to */etc/hosts* unless the nameserver failed to respond. Now, an extensive set of configuration parameters allows describing the nameserver policy in detail. See the man page for *switch(4)*.

- Maintaining time sync on multiple systems is now available through Network Time Protocol (NTP). By configuring NTP on several systems, a centralized time server will keep each of the systems at the correct time.

- Remote users can now choose SLIP or CSLIP protocol for modem-to-LAN connections. In addition to CSLIP on serial ports, the DTC can be configured to support SLIP and CSLIP connections up to 9600 baud.

- For graphic displays, *imageview(1)* has been enhanced to include image manipulation capabilities such as cutting/pasting sections of the image, adjusting the contrast and brightness, and rotating the image. Most of these features were part of the MPower version of *imageview(1)*.

- Process Resource Manager is a new

product for 10.0 that can ease the task of managing long-term program loads. It provides greater control over the CPU resources by guaranteeing users and groups of users a minimum percentage of CPU cycles, while allocating lower priority to jobs that may run for extended periods.

- At the General Business Release, a new file system called the Journaled File System (JFS) is introduced. By using logging to track file system changes, greater integrity of the file system is ensured, and recovery during *fsck(1m)* checks is substantially faster. An optional product called OnLineJFS will handle defragmentation, expansion, and backup of JFS volumes *online*.

Summary

While 10.0 may be the most ambitious revision in the history of HP-UX, the extensive testing and prerelease evaluations have led to a very reliable product, with features that most users and administrators will want. It is a solid operating system environment offering both extensive industry standards conformance and HP-UX unique features. If you haven't obtained a copy of the 10.0 Release Notes yet, they are located on your 10.0 system in the directory */users/share/doc*, along with several other white papers.

To obtain a copy of the 10.0 Release Notes by mail, send a fax to (404) 988-3991 to request the HP-UX 10.0 New Business Release information. Your fax must include your name, company address, and phone number and should indicate that you are requesting information on HP-UX 10.0. ■

Bill Hassell is a support engineer at the HP Atlanta Response Center. He can be contacted via e-mail at blh@hpuaatl.atl.hp.com.

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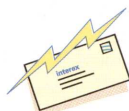
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Networking Background for System Administrators

Part 2

by Marty Poniatowski

In the last issue of *hp-ux/usr* I provided some background on the basics of networking. Included in this discussion were fundamental networking concepts and a great deal of practical information including:

1. A description of each of the seven layers of the ISO/OSI model shown in *Figure 1*.
2. An overview of class A, B, and C addresses shown in *Figure 2*.
3. A description of subnet masks shown in *Figure 3* and an example of how the subnet mask is used.

You may want to review that article before you read this one, although this article can easily be read and understood without having read Part 1.

IP addresses are used in various setup files that will be covered shortly when the */etc/hosts* file is described. Every interface on your network must have a unique IP address. Systems that have two network interfaces must have two unique IP addresses. If you are about to set up your network for the first time, your HP technical consultant can help you obtain your IP addresses. You will need these addresses before you can perform any of the setup steps covered later.

Let's now switch to the high level and look at some networking functionality and then come back to some of the details of configuring networking on HP-UX.

Using Networking

The ISO/OSI model shown in *Figure 1* is helpful for visualizing the way in which the networking layers interact. The model does not, however, tell you how to use networking. This is really your goal. Before you perform any configuration, you need to know how networking is used. Two widely used networking

services that are worth taking a look at as you set up your system are ARPA and NFS.

There is a lot to understand when it comes to ARPA and NFS. The good news is that with SAM it is trivial to get networking running. Before you use SAM to achieve the networking functionality you desire, you should understand the means by which you would achieve this functionality manually. Networking, by definition, means you will probably be leaving the homogeneous and comfortable domain of HP-UX (no pun intended to Apollo Domain users). That means, of course, that all kinds of uncertainties will arise; more specifically, you won't know why you can't communicate with other systems. If you rely exclusively on SAM, it will be very difficult for you to begin to troubleshoot networking problems.

The first networking product to configure on your system is HP 9000 ARPA Services, what I have been calling ARPA. ARPA is a combination of "ARPA Services" and "Berkeley Services." ARPA Services support communications among systems running different operating systems, and Berkeley Services support UNIX systems. Although there are many programs that can be run under each of these services, the following are the most commonly used ones in the HP-UX world. In some cases there are examples that show how these commands are used. For all of the examples the local host is system1 and the remote host is system2.

ARPA Services (*Communication Among Systems with Different OS*)

File Transfer Protocol (ftp). Transfer files, or multiple files, from one system to another. This is often used when transferring files between an HP-UX workstation and a Personal Computer or VAX, etc. The following example shows copying the file */tmp/krsort.c* from system2 (remote host) to the local directory on system1 (local host).

	comments
\$ ftp system2	Issue ftp command
Connected to system2.	
system2 FTP server (Version 16.2) ready.	
Name (system2:root): root	Login to system2
Password required for root.	
Password:	Enter password
User root logged in.	
Remote system type is UNIX.	
Using binary mode to transfer files.	
ftp> cd /tmp	cd to /tmp on system2
CWD command successful	
ftp> get krsort.c	Get krsort.c file
PORT command successful	
Opening BINARY mode data connection for krsort.c	
Transfer complete.	
2896 bytes received in 0.08 seconds	
ftp> bye	Exit ftp
Goodbye.	
\$	

FIGURE 1 ISO/OSI Network Layer Functions

LAYER #	LAYER NAME	DATA FORM	COMMENTS
7	Application		User applications here
6	Presentation		Applications prepared
5	Session		Applications prepared
4	Transport	Packet	Port-to-port transportation handled by TCP
3	Network	Datagram	Internet Protocol (IP) handles routing by either going directly to the destination or default router
2	Link	Frame	Data encapsulated in Ethernet or IEEE 802.3 with source and destination address
1	Physical		Physical connection between systems. Usually thinnet or twisted pair

FIGURE 2 Address Classes

ADDRESS CLASS	NETWORKS SUPPORTED	NODES PER NETWORK	ADDRESS RANGE		
A	127	16777215	0.0.0.1	-	127.255.255.254
B	16383	65535	128.0.0.1	-	191.255.255.254
C	2097157	255	192.0.0.1	-	223.255.254.254
Reserved	-	-	224.0.0.0	-	255.255.255.255
Looking at the 32-bit address in binary form, you can see how to determine the class of an address.					

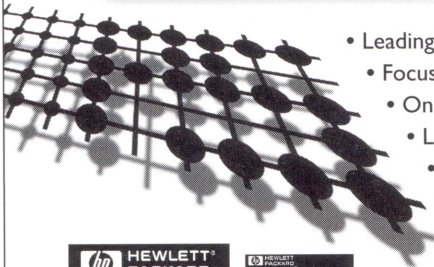
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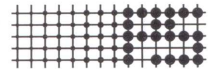


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FIGURE 3 *Example of Using Subnet Mask to Compare Addresses*

		address of system on subnet 12			
decimal		152	128	12	1
	binary	10011000	10000000	00001100	00000001
		<i>network addresses are the same</i>		<i>subnet id's are different</i>	<i>host id's don't matter</i>
subnet mask		11111111	11111111	11111111	00000000
binary		10011000	10000000	00001101	00000001
	decimal	152	128	13	1
		address of system on subnet 13			

In this example both systems are running HP-UX; however, the commands you issue through ftp are operating system independent. The *cd* for change directory and *get* commands used above work for any operating system on which ftp is running.

The chances are that you will be using your HP-UX system(s) in a heterogeneous environment and may therefore use ftp to copy files and directories from one system to another. Since ftp is so widely used, I'll describe some of the more commonly used ftp commands.

ascii—Set the type of file transferred to ASCII. This means you will be transferring an ASCII file from one system to another. This is the default so you don't have to set it.

Example: `ascii`

binary—Set the type of file transferred to binary. This means you'll be transferring a binary file from one system to another. If, for instance, you want to have a directory on your HP-UX system that holds applications you copy to non-HP-UX systems, you will want to use binary transfer.

Example: `binary`

cd—Change to the specified directory on the remote host.

Example: `cd /tmp`

dir—List the contents of a directory on the remote system to the screen or to a file on the local system if you specify a local file name.

Example: `dir /users/eileen`

get—Copy the specified remote file to the specified local file. If you don't specify a local file name, the remote file name will be used.

Example: `get krsort.c`

lcd—Change to the specified directory on the local host.

Example: `lcd /tmp`

ls—List the contents of a remote system directory to the screen or to a file on the local system if you specify a local file name.

Example: `ls`

mget—Copy multiple files from the remote host to the local host.

Example: `mget *.c`

put—Copy the specified local file to the specified remote file. If you don't specify a remote file name, the local file name will be used.

Example: `put test.c`

mput—Copy multiple files from the local host to the remote host.

Example: `mput *.c`

system—Show the type of operating system running on the remote host.

Example: `system`

bye/quit—Close the connection to the remote host.

Example: `bye`

There are additional ftp commands beyond what I have covered here. If you need more information on these commands or wish to review additional ftp commands, the HP-UX manual pages for ftp will be helpful.

Telnet. Telnet is an alternative to using *rlogin* described later. The following example shows establishing a telnet connection with the remote host system2:

	comments
<code>\$ telnet system2</code>	
Connected to system2.	Telnet to system2
HP-UX system2	
login: root	Login as root on system2
password:	Enter passwd
Welcome to system2.	
<code>\$</code>	HP-UX prompt on system2

Domain Name System. This is commonly used to support communication among systems on a large network such as the Internet. Not described here.

Berkeley Commands (Communication Between UNIX Systems)

Remote Copy (rcp). This program is used to copy files and directories from one UNIX system to another. To copy `/tmp/krsort.c` from system1 to system2 you could do

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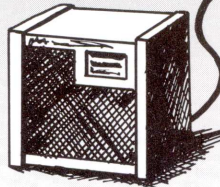
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the following:

```
$ rcp system2:/tmp/krsort.c /tmp/krsort.c
```

You need to configure some networking files to get this level of functionality. In this example the user who issues the command is considered “equivalent” on both systems and has permission to copy files from one system to the other with *rcp*. (These will be described shortly.)

Remote login (*rlogin*). Supports login to a remote UNIX system. To remotely log in to system2 from system1 you would do the following:

```
$ rlogin system2
password:
Welcome to system2
$
```

If a password is requested when the user issues the *rlogin* command, the users are not equivalent on the two systems. If no password is requested, the users are indeed equivalent.

Remote shell (*remsh*). With the *remsh* command you can sit on one HP-UX system and issue a command to be run remotely on a different HP-UX system, and have the results displayed locally. In this case a *remsh* is issued to show a long listing of */tmp/krsort.c*. The command is run on system2 but the result is displayed on system1, where the command was typed:

```
$ remsh system2 ll /tmp/krsort.c
-rwxrwxrwx 1 root sys 2896 Sept 1 10:54 /tmp/krsort.c
$
```

In this case the users on system1 and system2 must be equivalent or permission will be denied to issue this command.

Remote who (*rwho*). Find out who is logged in on a remote UNIX system. Here is the output of issuing *rwho*:

```
$ rwho
root      system1:ttyu0      Sept 1 19:21
root      system2:console  Sept 1 13:17
tomd      system2:ttyp2       Sept 1 13:05
```

└─ time of login

└─ day of login

└─ terminal line

└─ machine name

└─ user name

For *rwho* to work, the *rwho* daemon (*rwhod*) must be running.

Host Name Mapping

Your most important decision related to networking is how you will implement host name mapping in ARPA. There are three techniques for host name mapping:

- Berkeley Internet Named Domain (BIND)
- Network Information Service (NIS)
- HP-UX file */etc/hosts*

The most common and simplest way to implement host name mapping is with */etc/hosts*, so I'll cover that technique here. Keep in mind that there are networking manuals devoted to many networking topics including NFS, ARPA, and others. These manuals serve as good reference material if you need to know more about networking than is covered here.

/etc/hosts

This file contains information about the other systems you are connected to. It contains the Internet address of each system, the system name, and any aliases for the system name. If you modify your */etc/hosts* file to contain the names of the systems on your network, you have provided the basis for *rlogin* to another system. There is an important distinction here that confuses many new HP-UX administrators. Although you can now *rlogin* to other UNIX systems, you cannot yet *rcp* or *remsh* to another system. Don't worry though; adding *remsh* and *rcp* functionality is easy and I'll show you this next. Here is an example */etc/hosts* file:

127.0.0.1	localhost	loopback
15.32.199.42	a4410827	joeh
15.32.199.28	a4410tu8	
15.32.199.7	a4410922	
15.32.199.21	a4410tu1	
15.32.199.22	a4410tu2	tomd
15.32.199.62	a4410730	
15.32.199.63	hpxterm1	
15.32.199.64	a4410rd1	
15.32.199.62	a4410750	hp1

This file is in the following format:

```
<internet_address>      <official_hostname>  <alias>
```

The Internet Protocol address (IP address) is either a class "A," "B," or "C" address. A class "A" network supports many more nodes per network than either a class "B" or "C" network. The purpose of breaking down the IP address into four fields is to define a node (or host) address and a network address. *Figure 2* shows the breakdown of the classes of addresses. This is described in detail in Part 1.

Assuming the above */etc/hosts* file contains class "C" addresses, the rightmost field is the host or node address, and the other three fields comprise the network address.

You could use either the *official_hostname* or the *alias* from the */etc/hosts* file when issuing one of the ARPA or Berkeley commands described earlier. For instance, either of the following ARPA commands will work:

```
$ telnet a4410750
```

or

```
$ telnet hp1
```

Similarly, either of the following Berkeley commands will work:

```
$ rlogin a4410750
```

or

```
$ rlogin hp1
```

/etc/hosts.equiv

If you don't want users to have to issue a password when

they *rlogin* to a remote system, you can set up equivalent hosts by editing this file. If you have many hosts on your network that you wish to be accessed by the same users, you will want to create this file. The login names must be the same on both the local and remote systems for */etc/hosts.equiv* to allow the user to bypass entering a password. You can either list all of the equivalent hosts in */etc/hosts.equiv* or you can list the host and username you wish to be equivalent. Users can now use *rcp* and *remsh* because they are equivalent users on these systems. I usually just enter all of the hostnames on the network. Here is an example of */etc/hosts.equiv*:

```
a4410730
a4410tu1
a4410tu2
hpxterm1
a4410827
a4410750
```

Keep in mind the potential security risks of using */etc/hosts.equiv*. If a user can log in to a remote system without a password, you have reduced the overall level of security on your network. Even though your users may find it convenient not to have to enter a password when logging into a remote system, you have given every user in */etc/hosts.equiv* access to the entire network. If you could ensure that all permissions on all the files and directories on all systems were properly set up, then you wouldn't care who had access to what system. In the real HP-UX world, however, permissions are sometimes not what they are supposed to be. Users have a strong tendency to "browse around," invariably stumbling upon a file they want to copy which they really shouldn't have access to.

/.rhosts

This file is the */etc/hosts.equiv* for superuser. If you log in as root, you will want to have this file configured with exactly the same information as */etc/hosts.equiv*. If you do this, however, you have compounded your network security risk by allowing superuser on any system to log in to a remote system without a root password. If you are the undisputed ruler of your network and you're 100 percent certain there are no security holes, then you may want to set up */.rhosts* so you don't have to issue a password when you remotely log in to a system as superuser. From a security standpoint, however, you should know this is frowned upon.

Continued

Now that you have made the appropriate entries in `/etc/hosts`, `/etc/hosts.equiv`, and `/rhosts`, you can use the ARPA Services ftp and telnet as well as the Berkeley commands `rcp`, `rlogin`, `remsh`, and `rwho`.

I have described the process of setting up the appropriate files to get the most commonly used ARPA Services up and running. Virtually every HP-UX system administrator will use the functionality I have described here. It may be that you require additional ARPA functionality such as BIND. You will want to refer to the HP-UX networking manuals if you need to configure your networking beyond what I have covered here.

Network File System (NFS)

NFS allows you to mount disks on remote systems so they appear as though they are local to your system. Similarly, NFS allows remote systems to mount your local disk so it looks as though it is local to the remote system. Configuring NFS to achieve this functionality is simple. You have to perform four activities to get NFS going on your system:

1. Start NFS.
2. Specify whether your system will be an NFS Client, NFS Server, or both.
3. Specify which of your local file systems can be mounted by remote systems.
4. Specify the remote disks you want to mount and view as if they were local to your system.

As with ARPA, there are other aspects to NFS you could enable, but I will again cover what I know to be the NFS functionality that nearly every HP-UX installation uses.

So far I have been using NFS terminology loosely. Here is a definition of some of the more important NFS terms:

Node—A computer system that is attached to or is part of a computer network.

Client—A node that requests data or services from other nodes (servers).

Server—A node that provides data or services to other nodes (clients) on the network.

File System—A disk partition, or in the case of a workstation, this might be the entire disk.

Export—Make a file system available for mounting on remote nodes using NFS.

Mount—To access a remote file system using NFS.

Mount Point—The name of a directory on which the NFS file system is mounted.

Import—To mount a remote file system.

These and other definitions, as well as a complete discussion of NFS, can be found in the *Installing and Administering NFS Services* manual.

ping

How do I know I have a connection between system1 and the router and the other systems on the other side of the router? I use the *ping* command. *ping* is a simple command that sends an ICMP echo packet to the host you specify once per second. You may recall that ICMP was earlier covered under the network, or third layer in Part 1. *ping* stands for Packet InterNet Groper. Here is how I know that system1 is connected to router1:

```
$ ping router1
PING router1: 64 byte packets
64 bytes from 128.185.61.2: icmp_seq=0. time=0. ms
64 bytes from 128.185.61.2: icmp_seq=1. time=0. ms
64 bytes from 128.185.61.2: icmp_seq=2. time=0. ms
```

Each line of output here represents a response that was returned from the device that was pinged. This means that the device responded. You will continue to get this response indefinitely and have to type `^c` to terminate the ping. If no output is produced, as shown below, then there is no response and you may have a problem between your system and the device you are checking the connection to:

```
$ ping system2
PING router1: 64 byte packets
```

You would see this message and that is as far as you would get. A `^c` will kill the ping and you'll see that some number of packets were sent and none were received. I did indeed get this response when issuing the *ping* command, so I know there is a problem with the connection between system1 and router1.

ping should be used only for testing purposes such as manual fault isolation because it generates a substantial amount of network traffic. You would not want to use *ping* on an ongoing basis such as a script that is running continuously.

Continued

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A nice variation of *ping* that I use is to specify a packet size of 4096 bytes, rather than the default of 64 bytes shown in the previous examples, and a count of the number of times *ping* will transmit before terminating, rather than having to type *^c* to terminate *ping*. The following example shows this:

```
$ ping router1 4096 5
PING router1: 64 byte packets
4096 bytes from 128.185.51.2: icmp_seq=0. time=8. ms
4096 bytes from 128.185.51.2: icmp_seq=1. time=8. ms
4096 bytes from 128.185.51.2: icmp_seq=2. time=9. ms
4096 bytes from 128.185.51.2: icmp_seq=3. time=8. ms
4096 bytes from 128.185.51.2: icmp_seq=4. time=8. ms
```

Notice that the time required to transmit and receive a response, the round trip time, is substantially longer than with only 64 bytes transmitted. I usually find that the round trip time for 64 bytes is 0 ms, although this depends on a number of factors, including network topology and network traffic.

lanscan

lanscan is used to get LAN device configuration status as shown below:

```
$ lanscan
```

Hardware Path	Station Address	Dev Lu	Hardware State	Net Interface Name Unit	State NM ID	Mjr Num
.0.2	0x080009353626	0	UP	lan0	UP 4	52

```
Encapsulation Methods
ETHER IEEE8023
```

lanscan provides a good summary of the state and configuration of your network interfaces. In this case there is one LAN card configured in the system. You would receive a line for each LAN card that is configured into your system (many systems have two identical LAN cards or one IEEE 802.3 card and one IEEE 802.5, or token ring, card). Here is a brief description of the *lanscan* headings in the order they appear above:

Series 700 or 800 hardware path.

The station address, which is sometimes known as the LAN or Ethernet address.

The logical unit (lu) of the device.

The hardware state of the device, which should be "UP."

The name of the network interface.

The network management ID.

The encapsulation method, which is ETHER, IEEE802.3, or both.

netstat

From the earlier description of the subnet mask you can see that routing from

one host to another can be configured in a variety of ways. The path that information takes in getting from one host to another depends on routing.

You can obtain information related to routing with the *netstat* command. The *-r* option to *netstat* shows the routing tables, which you usually want to know, and the *-n* option can be used to print network addresses as numbers rather than as names. In the following examples *netstat* is issued with the *-r* option (this will be used when describing the *netstat* output) and the *-rn* options so you can compare the two outputs:

```
$ netstat -r
```

Routing tables

Destination	Gateway	Flags	Refs	Use	Interface
localhost	localhost	UH	0	28	lo0
default	router1	UG	0	0	lan0
128.185.61	system1	U	347	28668	lan0

```
$ netstat -rn
```

Routing tables

Destination	Gateway	Flags	Refs	Use	Interface
localhost	127.0.0.1	UH	0	28	lo0
default	128.185.61.1	UG	0	0	lan0
128.185.61	128.185.61.2	U	347	28668	lan0

netstat provides some information about the router (the middle entry). The *-r* option shows information about routing, but there are many other useful options to this command. Of particular interest in this output is "Flags," which defines the type of routing that takes place. Here are descriptions of the most common flags from the HP-UX manual pages:

1=U	Route to a network via a gateway that is the local host itself.
3=UG	Route to a network via a gateway that is the remote host.
5=UH	Route to a host via a gateway that is the local host itself.
7=UGH	Route to a host via a remote gateway that is a host.

The first line of the *netstat* output is for the local host or loopback interface called lo0 at address 127.0.0.1 (you can see this address in the *netstat -rn* example). The UH flags indicate the destination address is the local host itself. This class A address allows a client and server on the same host to communicate with one another with TCP/IP. A datagram sent to the loopback interface won't go out onto the network, but will simply go through the loopback.

The second line is for the default route. This entry says send packets to router1 if a more specific route can't be found. In this case the router has a UG under Flags. Some routers are configured with a U, others, such as the one in this example, with a UG. I've found that I usually end up determining through trial and error whether a U or UG is required. If there is a U in Flags and I am unable to *ping* a system on the other side of a router, a UG usually fixes the problem.

The third line is for the system's network interface lan0. This means to use this network interface for packets to be sent to 128.185.61.

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route

netstat displays the routing tables for your system. Some are automatically created with the *ifconfig* command when your system is booted or the network interface is initialized. Routes to networks and hosts that are not directly connected to your system are entered with the *route* command.

You can make routing changes on the fly, as I did to change the Flags from U to UG as shown here:

```
$ /etc/route add default 128.185.61.1 3
```

First is the *route* command. Second we specify we wish to add a route; the other option is to delete a route. Third we specify the destination, in this case the default. This could be a specific host name, a network name, an IP address, or *default*, which signifies the wildcard gateway route shown in our example. Fourth is the gateway through which the destination is reached. In the above example the IP address was used, but this could also be a host name. The 3 corresponds to the count that is used to specify whether the gateway is the local host or a remote gateway. If the gateway is the local host, then a count of 0 is used. If the gateway is a remote host, which is the case in the example, a count of >0 is used. This will correspond to UG for Flags. This command manually changed the network routing table by adding a default route with the appropriate Flags. Again, you could add this line to */etc/netlinkrc* to run the *route* command when the system boots.

Before issuing */etc/route* with the add option, you can first use the delete option to remove the existing default route that is not working.

ifconfig

The *ifconfig* command provides additional information on a LAN interface. The following example provides the configuration of a network interface:

```
$ /etc/ifconfig lan0
lan0:  flags=63<UP,BROADCAST,NOTRAILERS,RUNNING>
      inet 128.185.61.2 netmask ffff0000 broadcast 128.185.61.255
```

From this example we can quickly see that the interface is up, it has an address of 128.185.61.2, and a netmask of ffff0000.

You can use *ifconfig* to get the status of a network interface as I have done here, to assign an address to a network interface, or to configure network interface parameters. The network address you have will fall into classes such as "A," "B," or "C," as mentioned earlier. You want to be sure you know the class of your network before you start configuring your LAN interface. This example is a class "B" network so the netmask is defined as ffff0000 (typical for a class "B" address) as opposed to fffffff0, which is typical for a class "C" network. The netmask is used to determine how much of the address to reserve for subdividing the network into smaller networks. The netmask can be represented in hex, as shown above, or in decimal format as in the */etc/hosts* file. Here is the *ifconfig* command I issued to configure the interface:

```
$ /etc/ifconfig lan0 inet 128.185.61.2 netmask 255.255.0.0
```

lan0 is the interface being configured.

inet is the address family, which is currently the only one supported.

128.185.61.2 is the address of the LAN interface for system1.

netmask shows how to subdivide the network.

255.255.0.0 is the same as ffff0000, which is the netmask for a class "B" address.

I have made good use of *netstat*, *lan-scan*, *ping*, and *ifconfig* to help get the status of the network. *ifconfig*, *route*, and */etc/hosts* are used to configure the network should you identify changes you need to make. The subnet examples show how flexible you can be when configuring your network for both your current and future needs. In simple networks you may not need to use many of these commands or complex subnetting. In complex networks, or at times when you encounter configuration difficulties, you may have to make extensive use of these commands. In either case, network planning is an important part of setting up HP-UX systems. ■

Marty Poniatowski is a technical consultant with Hewlett Packard. He is author of The HP-UX System Administrator's "How To" Book, published by Prentice Hall, which can be ordered by calling 1-203-377-4746.

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Convenience	"We have someone who comes in at night and carries a Trakker to each PC and backs them up one-by-one during the night. Users fill out a form if they need a file restored, and our night person restores the file."	"Plan-B backups are done with no user or operator intervention. The PC data is written to tape as part of our HP9000 backup. Users have a program on their PCs which they use to restore any file, any time, in seconds."
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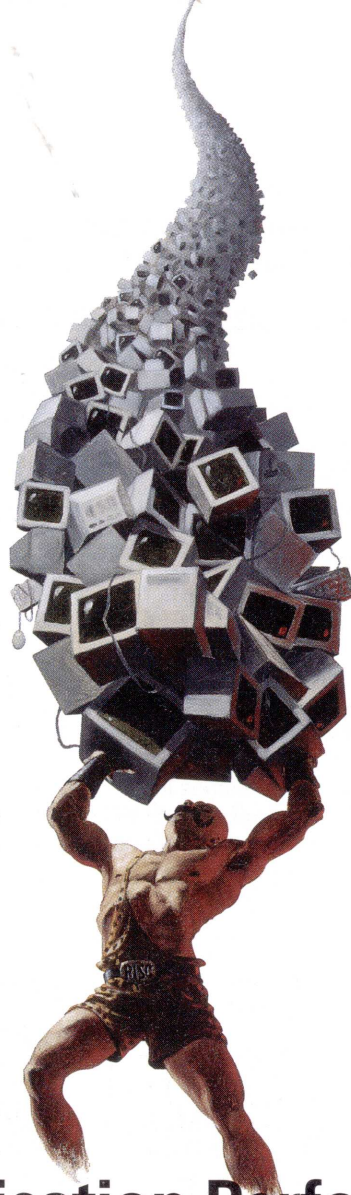
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CIRCLE 26 ON READER SERVICE CARD



X Application Performance Characterization Using **X** Terminals in a Client-Server Environment

One of the areas of concern when configuring a network with X Terminals and Servers is determining how many X Terminals can be supported by the network and the servers on the network. This article presents the results of application performance characterizations done with popular X applications such as Desktop Publishing, CAD, and Data Base. The results include the limiting factors found as well as recommendations for possible configurations. Finally, I will discuss an X performance tool for measuring response times in a transaction-based system.

b y K e n O l i v e r

With the availability of dramatically more performance in lower cost servers, there has been a trend towards downsizing centralized mainframes into a distributed architecture made up of a combination of computation- and application-specific servers. Once the decision has been made to go to this distributed architecture, the desktop device and graphical user interface (GUI) must be chosen. Many companies have chosen the X Window System as the GUI because of its flexibility and industry-standard status. With the trend to larger color screens (17/19 inch), and a need for much higher performance desktop devices to run GUIs, the X Terminal has become a popular desktop device.

With the X Terminal's increased use, it is necessary to answer the following questions:

1. How many X Terminals can a high-performance RISC server support?
2. How do I configure the server to support X Terminals and get the best price/performance?

Test Descriptions

The tests were done on a dedicated subnet with each of the applications mentioned in *Table 1*. The tests were not a functionality test of the software package but sample test scripts developed in conjunction with the software companies to represent the typical user environment for each application.

The resources measured in each of the tests were as follows:

- Host memory utilization
- CPU utilization
- LAN utilization
- X Terminal resources used

TABLE 1 *Application Resources Summary*

APPLICATION ¹	NUMBER OF X TERMINALS ²	HOST MEMORY (MB) PER USER	SWAP SPACE (MB) PER USER	AVG % LAN UTILIZATION ³
Wingz	7-10	3-2.7	3.0-5.0	6-7%
Island	8-10	2.6-5.1	4.0-6.0	4-6%
MountainTop	3-9	5.6-8.7	9.0+	6-8%
Frame	7-10	3.5-4.0	4.5-6.0	6-8%
Softbench	3-6	4.7-7.7	20.0+	6-10%
BBN RS1 Series	8-15	1.8-3.2	3.2-5.1	4-5%
Interleaf	3-6	10.3-12.8	16-40	8-12%
Oasis	5-13	1.7-2.8	2.1-6.1	3-4%
ARC/INFO	6-7	6.0 average	25-85	16-34% ⁴
ARC/View	12-17	2.0 average	25-85	6-13% ⁵
EOS Unigraphics	2-4	6.1-10.5	25.0+	7-9+

1. Applications tested on HP 9000 Model 720 with 64 MB of host memory. SPECmark-89 rating of 66.5.

2. Lower number of X Terminals were for a light load while higher number were for a heavy workload.

3. All testing was done on a dedicated subnet. Studies have shown that subnet LAN loadings up to 25 percent average utilization do not lead to a performance degradation on the X Terminal.

4. ARC/INFO and ARC/View downloaded very large images to the X Terminal during some tests.

5. same as 4.

Performance Tools

In order to get accurate and repeatable results, it was necessary to set up a stand-alone performance lab equipped with hardware and software to complete the measurements. The main tools used were:

- a LAN Analyzer, which monitored the LAN utilization, frames per second, average frame size, and any errors or collisions that occurred
- a software resource monitor that measured in real time the CPU, memory, process and disk utilization
- a commercially available X application characterization tool that allowed the capture and replay of the X client(s) against the System(s) Under Test (SUT).

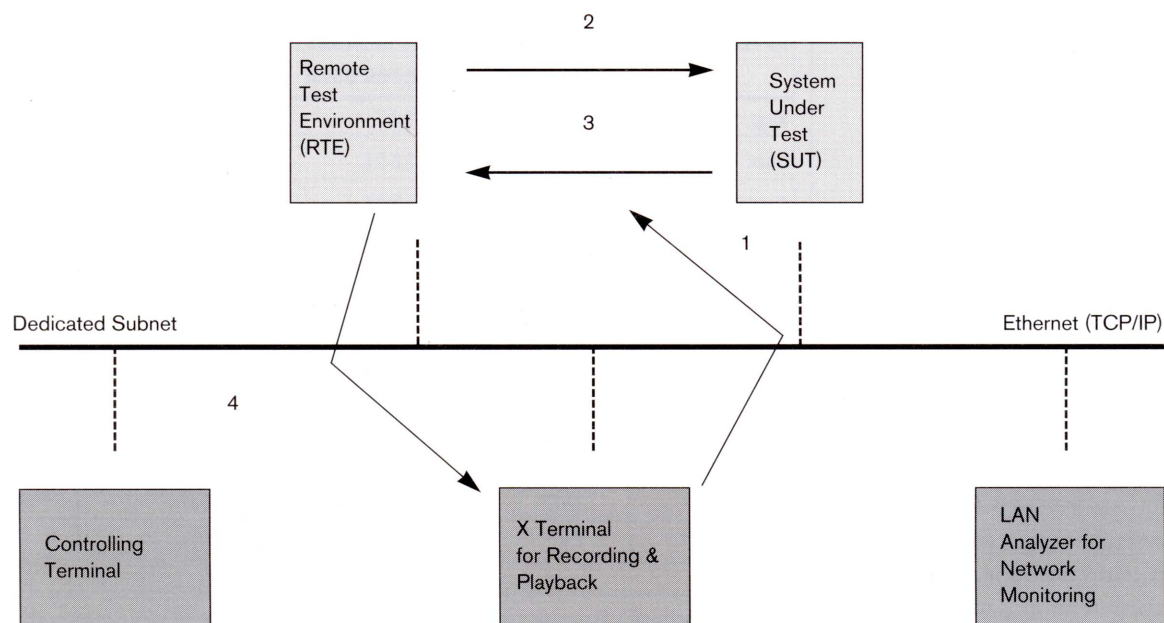
This tool allowed the testing of many X Terminals on a particular host computer without the actual X Terminal hardware being present. The tool ran

on another computer that is usually called a Remote Terminal Emulator (RTE). The concept behind this tool is that it captures the characteristics of the X server running on the X terminal and then replays the captured transactions against the SUT. Therefore, the SUT reflects the load that would be experienced if actual users on X Terminals were used. This also included the actual LAN traffic between the client program and the X Terminals.

Please refer to *Figure 1* for the testing model used. As seen in *Figure 1*, the RTE monitors all the X protocol during the capture process. By doing this, the X performance tool is able to build an automated script file that can be run multiple times to emulate users without the X Terminal hardware being present. Once the script file(s) have been captured, the RTE can replay any number of the script types directly against the SUT.

Continued

FIGURE 1



Some of the characteristics of the tool are:

- serverless emulation; i.e., no X Terminal hardware required
- captures performance of the X server
- stresses multiple SUTs on the network
- automated Script capture
- keystrokes can be edited. This provides the capability of editing ASCII typed characters
- ability to capture in defined and repeatable segments
- C language can be embedded
- typing rate and think times can be altered dynamically to reflect user interactions
- user-defined transactions to enable custom timing definitions
- fast reporting in order to determine transactions per second and response times

Methodology

In order to get true measurements

of how many resources an application used, it was necessary to follow a rigid testing method that gave a set of baseline measurements and a maximum number of users at a particular memory configuration for a given high-performance RISC server. The steps followed were:

1. Develop a set of typical user transactions/functions as defined by an "expert" from the software company who understands how customers use the product.
2. Measure resources used by a single user on a stand-alone server on a dedicated subnet of the LAN. Add several more users and measure the incremental resources required. This will be the extra resources required for each additional user. This number will be smaller than the single user number because shared libraries are used in the code. Experience has shown that it usually averages approximately 80

percent of the single user number.

3. Start testing at a small memory size such as 16 MB. This is necessary to put pressure on the memory management system, because UNIX will keep as much data as possible in main memory until it is forced to move data to virtual memory. Many code segments in an application are used infrequently, and that memory can be used for user applications if the system is forced to remove them. This approach will give you the maximum number of users a particular server can support.
4. Add X Terminal users until the interactive response is unacceptable. This is one of the most difficult metrics to measure. It has been found that it is necessary to have an expert user available to help set this performance metric and to participate in the actual testing. The best method I have found is to start with the number of users desired

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and have one of those users, the expert user, as a subjective measure of relative performance. This will serve as a check on the measured response time according to the performance tool. This is necessary because of the interactive nature of the Graphical User Interface, especially if the user-defined transaction includes menu picks from pop-down menus and mouse movements. This will be the area where performance first begins to degrade and causes the users to become frustrated.

The definition of "unacceptable performance" was the load at which the expert user noted that mouse movements and/or menu picks were "too slow." This was defined to be when menu picks were longer than one second and/or mouse movements lagged behind the physical mouse movement.

5. Add memory in a planned manner, such as increments of 16 MB, and repeat above until total memory range has been utilized. Once the entire memory range was completed, it was possible to generate a table of active users for each memory configuration. Please see *Table 1* for the range of active users.
6. At each step record system resources, CPU utilization, memory utilization, and paging and swapping statistics. If any swapping occurred, then no more users were added and the next memory configuration was tested. The peak as well as the average utilization of the LAN was recorded at each step.

This method will give the number of active users possible for the configuration being tested. These are the users who are

constantly using resources on the system. Usually people express their requirements in terms of number of logged-on users rather than active users. The rule of thumb is that 40 to 60 percent of the number of logged-on users are active users. By determining the number of active users, it is possible to estimate the number of logged-on users that can be supported.

In order to size the servers properly, it is important to know the number of active versus logged-on users required for the server. To estimate the Host Memory required, use the number of logged-on users. To estimate the CPU power required, use the number of active users. It is very important to understand the person's definition of active user and the frequency of the demand upon the server. With a long think time between requests, it is possible to support more active users on the high-performance RISC servers.

Rules of Thumb

The following Rules of Thumb can be used to estimate the size of the RISC server required:

Host Memory	Range: 2 to 6 MB per user depending on application requirements. Certain applications such as CAD may require more memory.
CPU	Approximately 2 to 4 SpecInt per User depending on computer requirements
X Terminal Memory	2 to 4 MB for simple graphics clients, 6 MB for more graphics-intensive clients, 10 MB if local clients are being used. Local Clients run in the X Terminal and use its

memory. Examples are terminal emulators and window managers.

LAN Loading .25 percent per X Terminal doing terminal emulation, 1 percent per X Terminal doing MCAD or graphics-intensive clients. Limit the number of X terminals to 25–40 per subnet if average LAN utilization is > 40%

X Terminal Memory Usage

It is very common for users to over-configure the X Terminal memory.

The following items use X Terminal memory:

1. Fonts
2. Bitmaps, Pixmaps
3. Large number of windows
4. Backing Store, Save Under
5. Local Clients

Applications Testing Results

Putting memory into the X Terminal does not gain you any application performance unless you are using the backing store feature, which allows the fast repainting of hidden windows. Without this feature activated, large drawings must be redrawn from the host, which is slow and aggravating for the user. The caution is that this feature requires a significant amount of memory in the X Terminal, e.g., an extra 2 to 4 MB of memory if the hidden portion of the window is large and has complex graphics. This would typically be used in CAD type applications or graphics applications that have overlapping windows.

General Observations

Three overall observations can be made as a result of the testing:

1. Host Memory—Once memory is full on the Server and swapping begins, serious performance degradation happens immediately. There are two types of virtual memory access. One is called paging and a low paging rate can be tolerated and will not normally affect performance. The other virtual memory access is called swapping. This causes all segments of memory associated with an application to be removed from main memory. In the case of MOTIF applications this can be in the range of 4 to 6 MB (or larger). Swapping this to disk takes 4 to 6 seconds and an additional 4 to 6 seconds to bring it back into memory. This will cause a significant delay in the response time experienced by the user. This is why it is very important to have enough host memory to keep the working set for the applications used by all users memory-resident.

2. CPU—Once the average CPU utilization was over 80 percent, the throughput of the applications suffered. The high-performance RISC servers were able to keep the interactive response constant as long as the host memory was not exhausted. Please see *Table 1* for the number of users that were found acceptable for the applications tested. The amount of host memory on the RISC server was limited to 64 MB and was found to be the limiting factor, not the CPU for the tests conducted.

3. LAN—On the dedicated subnet, the LAN traffic for the applications tested was not the limiting factor. *Table 1* shows the average LAN utilization found during the testing. The average X packet size on the LAN was 150 Bytes. The

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only caveat is that if you add X Terminals to an already busy LAN, performance may suffer.

The recommended configuration is to keep all the X Terminal traffic on its own subnet wherever possible. It has also been found that it is best to keep NFS file server traffic between servers on its own LAN segment. This is due to the different nature of the data. The X traffic is traditionally in small packet sizes while the NFS packets are large in nature. Mixing of these packets on a busy LAN tends to cause some performance problems with X Terminal response times. A high-speed link such as FDDI or 100 BaseAnyLan (100 Mbits per sec) is recommended to link a large number of servers using NFS while keeping X terminal traffic on an Ethernet (10 Mbits per sec) subnet".

Future Directions

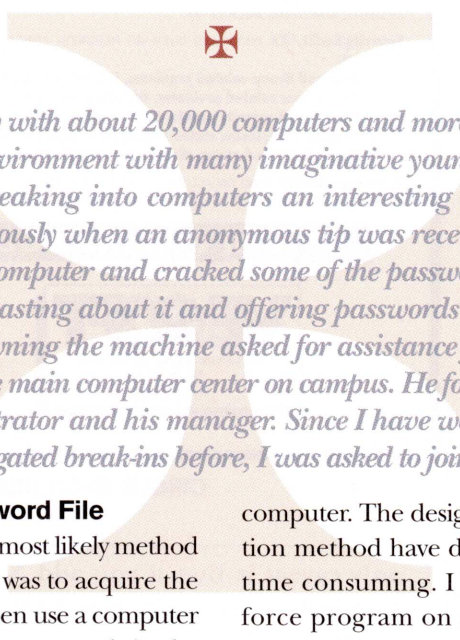
Studies are now being done to determine how well the application per-

formance scales to higher performance servers with significantly more host memory (1 GB or more). Other research is being jointly done with companies that have installed a large number (100 plus) of X Terminals on their network. This research will show the effects of a number of concurrent applications on the servers and the network in a production environment. ■

With Hewlett-Packard since 1977, Ken Oliver has supported HP customers as a database and networking consultant as well as spending two years in Japan transferring technologies to HP's subsidiary. For the past three years, he has been managing the Performance Program at HP's X terminal manufacturing division. In this role, he has been actively promoting X performance characterization with HP's Independent Software Suppliers as well as consulting with customers who are installing large networks of X terminals.

by Steen Hansen Hviid

BARBARIANS INSIDE THE GATE



Iwork at a university with about 20,000 computers and more than 50,000 students. This is an environment with many imaginative young people, some of whom may find breaking into computers an interesting challenge. It was therefore taken seriously when an anonymous tip was received that students had broken into a computer and cracked some of the passwords. The students were apparently boasting about it and offering passwords to other students. The department owning the machine asked for assistance from the Security Administrator at the main computer center on campus. He formed a team with the system administrator and his manager. Since I have worked with UNIX security, and investigated break-ins before, I was asked to join the team as well.

Cracking the Password File

We found that the most likely method used for the break-in was to acquire the `/etc/passwd` file and then use a computer program to crack the passwords in the file. Such programs are available on the Internet. One of them is the famous *Crack* program. Another smaller program is distributed as a part of the COPS security package from CERT (see "CERT—The Computer Emergency Response Team"). The programs usually report that they can crack a password without displaying the password itself. However, they can easily be modified to display their findings. Cracking a password by brute force, testing each of the about 6,600 trillion possible combinations, would take a long time using a powerful

computer. The designers of the encryption method have deliberately made it time consuming. I have tried a brute force program on an HP 9000/G50. Based on a weekend run, I estimate it would take more than two million years to try every possible combination. Instead, a good cracking program relies on a database of commonly used passwords. It also tests for passwords that are the same as the login ID, the login ID in reverse, and easy keyboard combinations such as "qwerty." The password cracking programs are still CPU-intensive, sometimes taking several hours, but can now run even on small systems (they take more than 30 hours on an old HP 9000/815). For a system administrator, running such a program can be helpful in encourag-



Illustration by Patrick Whelan



FIGURE 1 *List of Entries in /usr/adm/sulog File*

```

SU 08/18 20:39 - ttyw0 bguy-root
SU 08/18 20:40 + ttyw0 bguy-mcarroll
SU 08/18 20:40 + ttyw0 bguy-tony
SU 08/18 20:40 + ttyw0 bguy-smithg
SU 08/18 20:40 + ttyw0 bguy-loden
SU 08/18 20:40 - ttyw0 bguy-model
SU 08/18 20:40 - ttyw0 bguy-model
SU 08/18 20:41 + ttyw0 bguy-cbell
SU 08/18 20:41 + ttyw0 bguy-jtkirk
SU 08/18 20:41 + ttyw0 bguy-steen
SU 08/18 20:42 + ttyw0 bguy-nancyf
SU 08/18 20:43 - ttyw0 bguy-model
SU 08/18 20:50 + ttyw0 bguy-sam_exec

```

ing users to use better passwords. I run a cracking program the first weekend every month, and it is often able to crack a couple of passwords.

The NFS Access Hole

The intruders were allegedly not associated with the department, so they had not been issued an account on the computer. If they had had one, it would have been easy for them to copy the */etc/passwd* file and run it through the password cracker. Instead, they had probably accessed the root disk using NFS (Network File System, see sidebar), and simply copied the file. The */etc/exports* file specifies what parts of the file system are remotely accessible and, optionally, from what hosts. Here, the entire root disk was made available to any system. It was then simple to mount the whole disk on the intruders' local machine and copy the */etc/passwd* file. A safer approach would have been to export only the parts actually needed, such as the home directories of certain users (see the NSF sidebar for an example of such a setup). If many users needed to mount their home directories, it might have been simpler to

export the */users* directory.

The system administrator prevented further access by updating the */etc/exports* file with a list of the hosts that were allowed access. A few days later we found those restrictions had been removed again. Since several people have the root password on the targeted machine, we didn't know whether it was one of them who had removed the restrictions. The restrictions were put back in place and the password on the root account was changed.

What the Logs Showed

Meanwhile, I searched the system logs and found several tracks left by the intruders. In the */usr/adm/sulog* file I saw that on August 18 there were several successful uses of the *su* command to switch from user *bguy* to other users (see Figure 1). The *su* command is commonly used to assume root access from a regular user account, but may be used to become any user. Fortunately, the log file showed that the attempt to become root had not been successful, but the intruder apparently had cracked the password to *sam_exec* and other

accounts. I later noticed that *sam_exec* was an extra root account, because it also had user ID zero in the */etc/passwd* file. All of the attempts originated from the same user account, *bguy*, which we knew was rarely used by the real owner. The *su* attempts were all within a few minutes of each other, so it seemed the intruder was just testing the passwords. User *bguy* uses the C-shell, and I found a *.history* file left by the shell in the home directory. It showed the last twenty commands issued by *bguy*, giving us the first idea what this guy was doing. It showed the *su* commands and the user listing the contents of the directories of the penetrated user accounts; nothing dangerous, it seemed.

Using the *last -R* command, I listed all the logins for *bguy* and the other penetrated accounts. The list showed the times and the Internet address of the computer from which the intruder connected. Most sessions were logins (telnet), with a few *ftp* file transfers in between. All logins were from outside the department. Some came from public computers in the Engineering Department's computer lab, while most came in through the university's main modem pool. Fortunately, the security on these modems had been strengthened a few months earlier. A user dialing in through the modem pool must now supply a personal network user ID and a password to use the network. We decided not to contact the Engineering Department but to concentrate on the accesses through the modem pool.

The department maintaining the campus wide network provided us with a listing of all users who had come in through the modem pool and connected to the invaded computer. The list specified the date, time, and network

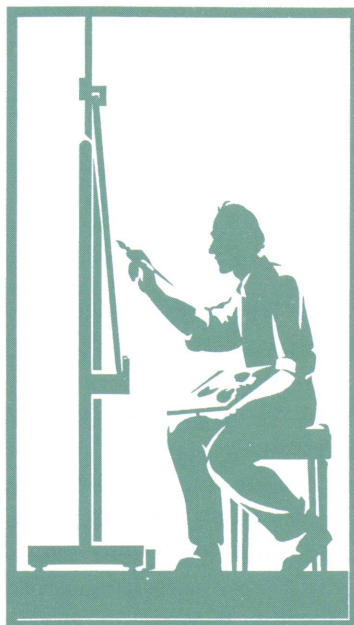
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FIGURE 2 Activity Excerpt, Based on System Logs

MODEM POOL		PENETRATED SYSTEM	
USER	TIME	USER	TIME
Aug. 17: burrelia	12:49	victor	12:50 - 13:28
Aug. 18: burrelia	17:48	victor	17:49 - 18:30
adolph03	20:38	bguy	20:38 - 20:45
ecoli. 2	20:48	bguy	20:49 - 20:50
Aug. 24: burrelia	10:08	victor	10:15 - 10:42
burrelia	10:37	victor	10:44 - 10:54

ID of each access. Comparing the list with the logs on the computer, we could start to put together a better picture of what was going on. We could see what ID was used to get in through the modem pool, and what user ID was used to log in to our computer. A shortened list is shown in *Figure 2* (the time stamps and user IDs are altered for privacy). The level of intrusion now seemed more complicated: Four different network IDs were used to access the *bguy* account. A fifth network ID was used to reach the account of a former student worker, *victor*, whose account had never been removed. *victor* logged in almost daily, and always from the same network account. Apparently there were two separate intrusions going on here, with more people involved. I used the university phone book to look up the owners of the network accounts; all were students. Two of them were listed with the same street address.

Keeping Watch

The passwords were changed on those accounts that we would not want the intruders to use, but some were left in place as bait. To keep a better eye on the intruders' activity, we set up a simple trap to record their use of the system. When the user logged in, an e-mail message would be sent to some

team members, stating which host the user was connecting from (using the `who -u` command).

While the user was logged in, the shell output was piped to a file so we could monitor what he did. When the user logged out, the file with the captured output would be e-mailed to us. We wanted to use the `script` command to record all this, but it was impossible to silence the startup message it displays, which would have given it away. Instead, we put our commands in a script that replaced the regular HP-UX `tabs` command. The real `tabs` command was renamed and called from the script. The `tabs` command is called by all users upon login, so we avoided having any suspicious commands in the setup files for the shells (`/etc/profile`, `.profile`, `/etc/csh.login`, and `.login`). Unfortunately, the user would have to exit twice to get out. If the user listed the processes, he would see some extra processes, so after a few days a special version of the `ps` command was added to filter them out. Our special `tabs` command appears in *Listing 1*. I am sure it can be done more elegantly, but it worked for us.

After a few days, the first result came in by e-mail. It was *bguy*, who first checked around by listing the users currently logged in. Then he used `su` to become another user (one of those we

left as bait) and spent quite a bit of time listing the collection of GIF and JPEG graphical files in the directory. He *ftp'd* a few of them to another host, possibly to his own home account. Our tracking method did not allow us to see his key-strokes, so we did not know to which account he copied the files. He also tried unsuccessfully to *ftp* to a computer at another university.

The second time *bguy* logged in, he suspiciously listed the `.login` and `.profile` files and the source code of a couple of programs stored in the same directory. Then he listed the shell variables. He may have become suspicious when he had to enter `exit` twice to log out the last time. He did not list the processes or otherwise seem to find anything and logged out again.

All the logins had until this time been done at night. Once I received an e-mail message from our `tabs` program during the day, showing *bguy* was logged in from a computer in the same department in which our computer is located. I quickly called the administrator, who walked over to the designated computer, hoping to catch the person red-handed. It turned out to be the real owner of the account, who on this rare occasion was using it.

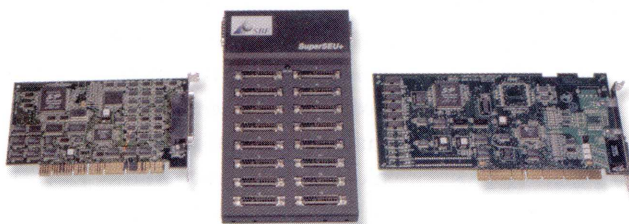
Meanwhile, *victor* had been logged in a few times. This intruder was using the account only to read and send personal e-mail, and telnet to another account and read some Usenet newsgroups. This person also wondered about the mysterious need for an extra `exit` and inspected the setup files without finding anything. Another time he listed the processes and noticed the extra `tabs` and `tee` processes (before the patched version of `ps` was put in place). After checking the `man` pages for `tee`, he again inspected the setup files.

Continued



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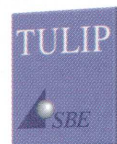
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CIRCLE 29 ON READER SERVICE CARD

The Vulnerable Password File

The password file is central to the security of a UNIX system. It stores the password for every user and information necessary to start a user process. It also serves as a lookup table when the user name is needed, as UNIX internally uses the number assigned to each user. Unfortunately, that means all processes must have *read* access to the file, which opens the door for password cracking programs. With a copy of the password file, a person can run a password cracking program that may crack some passwords in the file. There is then no need to attempt to break in by trying common passwords, which may possibly alarm the system administrator (the HP-UX *remwatch* program would e-mail a warning to the administrator). This method can be surprisingly effective, though, as demonstrated in Cliff Stoll's famous book *The Cuckoo's Egg*, which showed how many systems are protected only by simple passwords.

Breaking a good password is not easy. The password encryption algorithm uses a one-way function that is repeated 25 times. To prevent a cracking program from simply using a database of already encrypted passwords, each password can be encrypted in 4096 different ways. When the password is encrypted, two characters are selected at random as input to the encryption routine. These characters are called the "salt" and are stored as the first two characters in the encrypted password string. To test whether a password is correct, the entered password must be encrypted using the same salt as the one stored in the *passwd* file and then the two strings are compared. The simple C program in Listing 2 shows how it can be done. Store the program in the file *testpw.c* and compile it with the C compiler that comes with HP-UX. Execute the program and enter the password and the encrypted password string from the *passwd* file (if password expiration is enabled, omit the comma and the letters after it).

To prevent access to the encrypted passwords, some versions of UNIX have implemented a shadow password file. In HP-UX it is stored in */.secure/etc/passwd*, which can be created by SAM (select options "Auditing and Security" and then select "Users"). The shadow password file stores the password and an auditing number for each user, while the regular password file has the same format as before, except the password field now contains an asterisk. It is important that all users be listed in both files; otherwise they cannot log in. All the regular HP-UX commands instantly recognize the presence of the shadow password file, so it is easy to use.

Password aging is a means of ensuring that users change their passwords regularly. HP-UX supports password aging, though through SAM only at Version 10. The facility is implemented in HP-UX by expanding the encrypted password field by adding a comma and four letters. The information stored is the number of weeks the password is valid, and the week it was last changed. Since the system counts weeks from Thursday, January 1, 1970 (called the start of the epoch), all passwords will expire on a Thursday. It is also possible to specify how many weeks must pass between changes of passwords, to prevent users from immediately changing their passwords back to the old ones (there is no provision for a password history).

The information is coded using different letters of the alphabet. The string "C/CI" at the end of the encrypted password field means that the password must be changed every 14 weeks (C = 14), that a week must pass between changes (/ = 1), and it was last changed in the week starting 10/27/1994 (C=14, I = 20, and $14 + 64 \times 20 = 1294$ weeks. With the weeks starting with zero, that makes 9065 days since 1/1/70).

Apparently satisfied, he made no new attempts to investigate the cause.

Closing the Gate

Watching over the shoulders of the intruders did not seem to gain us any valuable information, so after a week we decided to ask the central network group to take action. Their policy in such cases is simply to block network access and then wait for any reaction. None of the intrusions had been malicious as far as we could tell, so major police action was not necessary. The five network accounts were blocked, and then we waited. The response showed up in the logs a few days later. While nobody logged in as *bguy*, no fewer than two new network IDs were used to get to *victor*. These two accounts were promptly blocked by the network center.

A few days later, the network center got a call from "Victor." He was asked to come in and was interviewed by a person from the network group together with the security administrator from our team. He explained that he had borrowed the network ID from a friend to get to his old *victor* account to read e-mail. When the network account was blocked, he borrowed the network IDs of two other former student co-workers. When both were blocked, he realized something was wrong and called the network center.

Since the users who had lent their IDs to *victor* needed their computer accounts, it was decided that they would be allowed to use them again; however, they would be restricted to a menu system that limited them to reading e-mail and newsgroups.

There was never any response from the other users, so we must assume that they know why their access was blocked.

NFS: Network File System

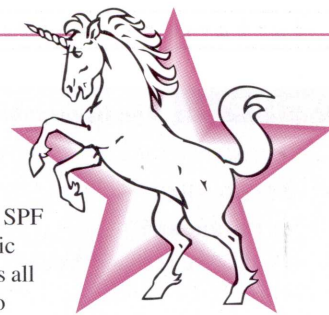
NFS was developed by Sun Microsystems and is available on most UNIX versions. It allows a disk on one computer (server) to be mounted on another computer (client) via the network. If set up properly, the mounted disk will appear as a regular disk on both systems, fully transparently to the users. NFS has many uses, such as sharing data among users on separate workstations and allowing a user to log in on different machines and still have full access to his private files. It can also ensure a reliable centralized backup.

A system must explicitly be set up to export a disk, or a directory on a disk, to make it available for access from other machines. First NFS must be enabled in the `/etc/netnfsrc` script, and then the exported parts of the file system must be specified in the `/etc/exports` file. If PCs need to access the exported directories, the `pcnfsd` daemon must also be enabled in the `/etc/netnfsrc` file.

Access to files and directories is similar to regular access. It is controlled by the user number and group number, as stored in the `/etc/passwd` file on both systems. As in most parts of UNIX, the user name is not used. It is therefore important that the user have the same number on both systems. Otherwise the files on the NFS disk will appear to be owned by another user when mounted, and possibly not accessible. Similarly, with unmatching user numbers, a user may appear to own the files of another user. If there is no user with a matching number on the NFS server, or the user is root, the access is considered anonymous. The user is then given the name *nobody* (an entry for user *nobody* should exist in the `/etc/passwd` file, with uid set to -2). These default actions can be modified.

If the user has root access on his local UNIX machine, he can alter his own user number intentionally to

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CIRCLE 4 ON READER SERVICE CARD

gain access. Fortunately, the NFS protocol normally disallows access for users with numbers less than 101, which are reserved for root and other administrative users.

To minimize security hazards, export specific directories instead of the full file system. Make sure to specify a list of the hosts allowed to mount each exported directory. If it is necessary to specify many host names, consider creating a group in the `/etc/netgroup` file.

Also, specify that anonymous access (i.e., by users with no matching user number) is disallowed. Here is an example of such a setup for HP-UX; some details differ with the platform.

```
$ cat /etc/exports
/users/joe -anon=65535,access=host1.domain.osu.edu
/users/jack -anon=65535,access=host1.domain.osu.edu:
host2.domain.osu.edu
```

The exported disks are mounted by the `rpc.mountd` daemon. This daemon normally runs in the background (started from `/etc/netnfsrc`), but can also be run on-demand by `inetd`, at a performance penalty. If run by `inetd`, wildcard access can be specified in the `/usr/adm/inetd.sec` file. It is possible to access NFS files without mounting the directory, though it is very difficult, so restricting the mounting is not as safe as controlling the access via the `nfsd` daemon.

The book *Managing NFS and NIS* by Hal Stern (O'Reilly & Associates) covers all aspects of NFS, including the special problems associated with NFS access from PCs.

LISTING 1 *The Bogus tabs Command*

```
#!/bin/ksh
usr=`whoami`
if [ "$usr" = "bguy" -o "$usr" = "victor" -o "$usr" = "mcarroll" -o
    "$usr" = "jtkirk" ]
then
    mailto="list-of-team-members"
    who -u | grep "$usr" | mailx -s "login by user $usr" $mailto
    /usr/bin/tabsx
    if [ $SHELL = "/bin/ksh" ]
    then
        /bin/ksh | tee /tmp/x$$
    else
        set noclobber
        set history=20
        /bin/csh | tee /tmp/x$$
    fi
    if [ -s /tmp/x$$ ]
    then
        mailx -s "log of user $usr" $mailto < /tmp/x$$
    fi
    if [ -f /tmp/x$$ ]
    then
        rm /tmp/x$$ > /dev/null 2>/dev/null
    fi
fi
```

LISTING 2 *Simple Program to Demonstrate UNIX Password Encryption*

```
#include <unistd.h>
main()
{
    char pw[20];
    char epw[20];
    char *tepw;
    printf("Enter password ");
    gets(pw);
    printf("Enter encrypted password string ");
    gets(epw);
    printf("Testing if %s encrypts to %s with same salt\n", pw,epw);
    tepw = crypt(pw, epw);
    if (strcmp( tepw, epw) == 0)
        printf("match\n");
    else
        printf("no match\n");
}
```


We still do not know whether these blocked accounts were used by their rightful owners, or by someone entirely different. Since two of the owners are listed with the same address, they are probably the owners of the accounts, but we may never know.

When the network accounts were blocked, all passwords on the department's computer were changed. The following morning all users of the system had to contact the system administrator to get their new passwords. To make sure that the intruders had not used the extra root account (*sam_exec*) to place any hidden back doors, the operating system was reinstalled.

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CIRCLE 39 ON READER SERVICE CARD

CERT: The Computer Emergency Response Team

The infamous Internet Worm in 1988 heightened the Internet community's awareness of security problems on the Net. In response, CERT was created as a resource to aid system administrators with security issues. Sponsored by the Advanced Research Projects Agency (ARPA) and based at Carnegie Mellon University, CERT offers assistance in emergencies and provides several security tools and warning bulletins.

When a major security problem is found with an operating system, CERT announces it on the USENET newsgroup *comp.security.announce* and via an e-mail list (send e-mail to cert-advisory-request@cert.org to be included on the list). The announcements usually say what to watch for and how to make a patch, if possible. They never include how the security hole is exploited.

Hewlett-Packard issues its own security bulletins. To subscribe, send an e-mail message to: support@support.mayfield.hp.com with the message text: "subscribe security_info." These bulletins are also posted on the *comp.sys.hp.hpux* newsgroup. They usually announce the availability of a security patch, often shortly after CERT has announced a problem that affects HP-UX sites.

The best-known tool from CERT is the COPS security package, which checks a system and provides recommendations for improving security. Another useful tool is *tcp_wrapper*, which provides logging of incoming telnet sessions. It is now provided as a part of HP-UX.

CERT can be contacted by phone (412-268-7090) or by e-mail (cert@cert.org). If your system has been penetrated, consider using the telephone instead of e-mail. Tools and documentation are available by anonymous *ftp* ([info.cert.edu](ftp://info.cert.edu)).

shadow password file (*/secure/etc/passwd*) and the number of people with the root password to the system was more limited. A formal procedure to keep track of changes to the system was also put in place. Later, a more thorough security audit of the system was done.

All names and identifications in this article are fictitious, to protect the privacy of the users. Special thanks to Brian O'Brien, the Data Security Administrator, for his help with this article. ■

Steen Hansen Hviid is a Computer Specialist at the Ohio State University in Columbus, Ohio. He holds a Masters degree in Computer Engineering from the Technical University of Denmark and is a Certified Computing Professional.

Software Review

by Jeff Hodges

A Remedy for Your Helpdesk Flu: A Review of the Remedy Action Request System V. 2.0.1

Few things in life (beer is one exception) gain the attention of support engineers faster than a tool that can assist them in the tracking and resolution of problems. For engineers whose time is spent solving system problems, the amount of time spent researching and documenting solutions is critical. The faster a problem can be resolved and documented, the better the service and the happier the user. Gone are the days of the sticky yellow notes, which once served as a documentation tool as well as modern art for office walls.

Automatic ticket generation, preset menu choices, database searches, customized views, automatic notification and escalation, and ad hoc reporting are now required in the support engineer's game. With the increasing number of companies distributing power and complexity from the data center to the desktop, these requirements are just signs of the times to come.

The Action Request System (ARS) is a sophisticated tracking toolset that can be used to track anything from enterprisewide helpdesk calls to lunch orders (*Figure 1*). The Action Request System is a true client-server environment with UNIX-based servers running on HP 9000 Series 7/800, Sun, SGI IRIS, and IBM RS6000 platforms. The system also supports clients running on all of the aforementioned systems as well as HP 9000 Series 400 and Microsoft Windows. The system makes use of the major UNIX-based databases including Oracle, Informix, Ingres, Sybase, and flat files to manage the data. For most environments, however, the flat file approach could result in significant pain for both users and administrators. Most of my experience has been with HP Systems and the

Ingres engine and so far the results have been acceptable. For this review we will be using the HP-UX/Motif-based servers and clients, all residing on the Ingres database. What differentiates ARS from the majority of tracking system tools is its use of the toolset approach rather than the solution approach. The engineers at Remedy have taken the position that the tool should fit into the customer's environment and model rather than changing the customer's model to match that of the tool. What this translates into is a robust system that provides helpdesk and tracking system designers a tremendous amount of flexibility in designing and optimizing a helpdesk or tracking environment.

Remedy Action Request System Version 2.0.1

ARS provides all of the components necessary for a support environment. Standard features include an administration tool, *aradmin*, a data entry/retrieval tool, *aruser*, and a notification tool, *notifier*. Keeping with the toolset mentality, it also provides the C language library functions from which all of the tools are created. So if you are not happy with the existing *notifier*, a couple of hundred lines of code and a six pack and you have a new one.

ARS also provides utilities for integration with HP OpenView, IBM NetView, Sun SunNet, e-mail, and Microsoft Windows applications.

aradmin

The administration tool is used for the creation of databases (schemas), the relationships between (active links), the data rules and procedures (filters/escalations), and external extensions (*Figure 2*). From this slick GUI interface an

FIGURE 1 *Action Request System*

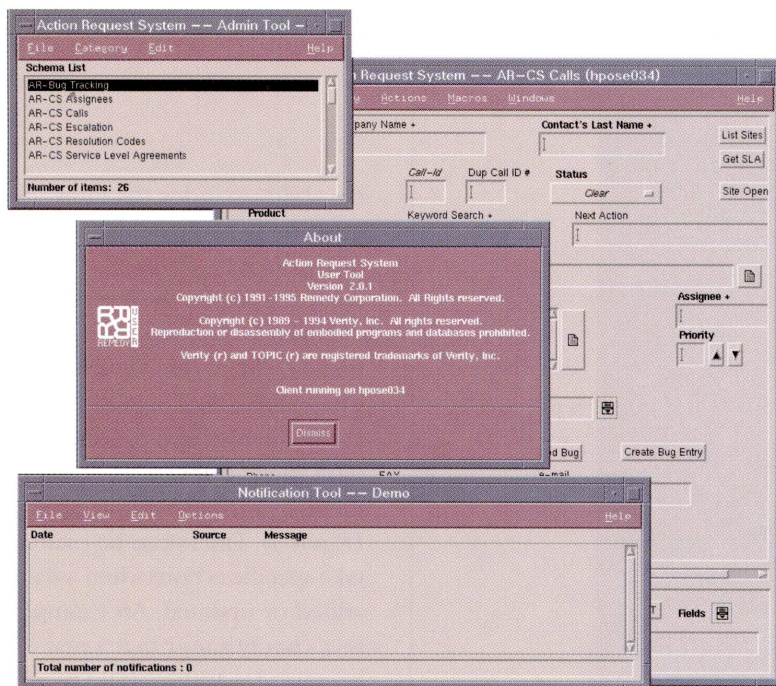
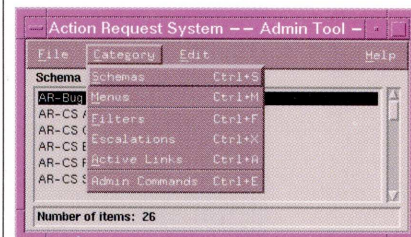


FIGURE 2 *Admin Tool*



administrator can define completely new schemas with a couple of button clicks and by dragging and dropping fields into place. ARS provides six standard field types including, integer, real, character, date/time, selection, and diary (Figure 3). All numeric and date/time fields are automatically checked for validity. Selection fields are used to limit the users to a finite number of choices and can be configured as radio buttons or pulldown menus.

Diary fields provide users with the ability to enter free-form text and have each update automatically stamped with user name and date. Character fields can be utilized also as free-form text fields, but the flexibility lies in the creation of pulldown menus and QBE menus. The menus are configured independently from individual schemas to facilitate sharing among databases.

This approach significantly reduces the amount of effort required to maintain the menus. All individual field and schema access is controlled on a group basis from this tool. To improve performance the tool also provides

FIGURE 3 *Field Properties*

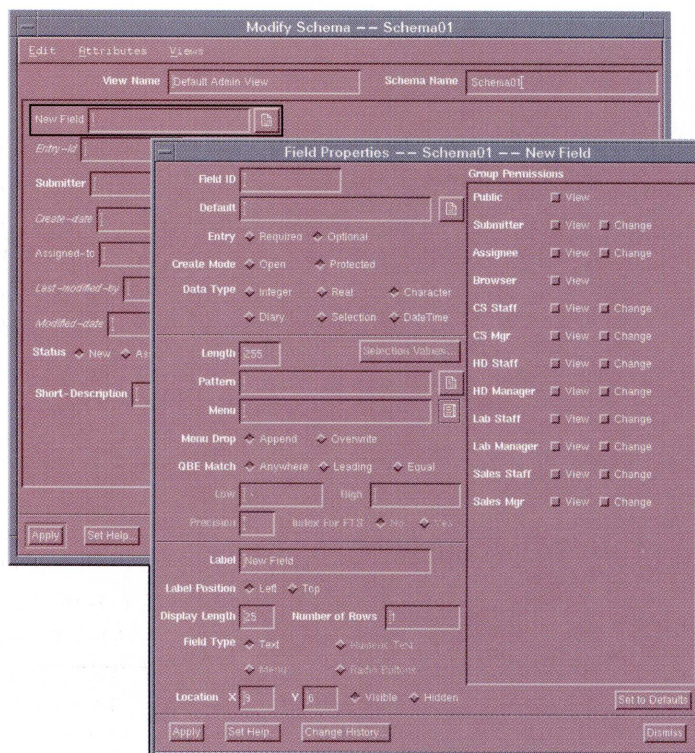


FIGURE 4 Filters

Modify Filter -- JDS-NotifyDelegatorOfNew

Filter Conditions

Filter Name: JDS-NotifyDelegatorOfNew

Schema Name: AR-HD Calls

Execute On: ☐ Query ☐ Modify ☐ Submit ☐ Delete ☐ Merge

Enable: ☒ No ☐ Yes

Execution Order: 0

Qualification: Status = "New" OR (Status = \$NULL)

Filter Actions

Notify: ☒ Message ☐ Log to File ☐ Set Fields ☐ Run Process ☐ 1 of 1 ☒ Shift

Notify Text: A new \$SCHEMA\$ entry has been created by \$Submitted by\$

User Name: Demo

Mechanism: ☒ Notifier ☐ E-mail ☐ User Default ☐ Cross Reference ☐ Other

Reference Field:

Subject Line:

Fields: ☒ None ☐ Add ☐ Changed ☐ All

# Duplicate Incidents	536970933
Assigned Priority	536970915
Assigned To	4
Call ID	1

Buttons: Modify, Delete, New Action, Previous, Next, Apply, Set Help, Change History, Dismiss

the ability to index the individual databases on variable fields. This comes in quite handy when the number of records gets into the tens of thousands.

Building the initial database is just the first step in creating a tracking system. The *aradmin* tool provides the ability to establish rules and procedures for the data items tracked. In Remedyspeak these are known as filters and escalations (Figure 4). Filters can be established to take specific actions when a data item is added or updated. An example would be to notify a user that a new entry has been made. A filter could be created to monitor the schemas for new entries and then send e-mail or pop up a dialogue message when a new entry is submitted. An escalation could be used to ensure that schema entries are updated in a timely fashion. For example, suppose a Service Level Agreement specifies that problems are escalated automatically when they remain idle for more than 15 minutes. In order to prevent entry into Service Level hell, an escalation would be created that queries the database periodically to look for problems that have not been worked on in the last 15 minutes. If a match is found, then the status of the problem is escalated to the appropriate level, which in turn invokes appropriate notification procedures.

Once the schemas are built, we will want to establish linkages between them using active links, all done via *aradmin* (Figure 5). Active Links are established to prevent storage of duplicate data. For example, assume we are running a helpdesk environment as well as tracking the company's assets. Using active links we can link databases that track user information, helpdesk call information, asset information, and solution information. Therefore, when a helpdesk call is taken,

FIGURE 5 Links

Action Request System -- Admin Tool --

Modify Active Link -- AR-Assets-GetContactInfo

Active Link Conditions

Active Link Name: AR-Assets-GetContactInfo

Schema Name: AR-Help Desk Assets

Execution Order: 500

Enable: ☒ No ☐ Yes

Execute On: ☐ Button ☐ Return ☐ Submit ☐ Modify ☐ Display ☐ Menu Choice ☐ Set Default

Field:

Button Label: Get Owner Info

Qualification:

Active Link Actions

Run Macro: ☒ Set Fields ☐ Run Process ☐ Message ☐ Change Field ☐ DDE ☐ 1 of 1 ☒ Shift

Macro Name: Get Contact Info-2

Comp/Cont Name: \$Asset Owner\$

Buttons: Modify, Delete, New Action, Previous, Next, Apply, Set Help, Change History, Dismiss

the support engineer knows where the user is physically located, what kind of system and application the user is running, and any known solutions to the user's problem. Likewise, the asset tracking folks will know who has what and where it is physically located.

aruser

The primary purpose of the *aruser* tool is the entry and retrieval of the data items being tracked (Figure 6). The *aruser* tool operates in two modes, query and submit. Basically the submit mode is used for making new entries and the query mode is used for searching, modifying, and reporting on data items. In fact, confusion between these two modes is probably the biggest annoyance I have with the system. It is all too easy to enter all the information for a new call only to realize you are in the wrong mode. ARS does provide a function that copies the information to the submit screen, but each instance is still worthy of a choice word or two. Like everything else with the system, it too is fully configurable. Screens can be adjusted to suit the individual user's taste. Don't like where the "Contact Name" field is located? No worries, just choose customize view and drag it where you want it. Tired of filling in all of the fields each time you create or update an entry? Set your user defaults to automatically fill in the standard items. Probably the most powerful feature provided by the *aruser* tool is the ability to create custom macros. A macro is literally a recorded set of instructions. Simply by clicking on "start recording," you can automate repetitive tasks such as reports and searches. ARS macros also allow the user to specify parameters; each time a macro is run, the user will be prompted for the para-

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FIGURE 6 *Tracking*
FIGURE 7 *Notification Tool*

Date	Source	Message
04/10/95 17:42:38	AR	A new AR-HD Calls entry has been created by Demo.
04/10/95 17:42:38	AR	You have been assigned call #CALL000064. It is a Low priority call.
04/10/95 17:46:22	AR	A new AR-HD Calls entry has been created by Jeff Hodges.
04/10/95 17:46:22	AR	You have been assigned call #CALL000065. It is a Low priority call.

meters. In fact, integration with the *notifier* tool is based on a series of internal macros that display and modify schema entries.

Also featured in the user tool is the ability to create custom reports. While the interface provides the ability for point and click reporting, the output quality and report complexity lack the sizzle of most of the commercially available report generation packages. Remedy makes up for this fact by providing DDE interfaces for Windows users and direct database access for hacks. As a word of caution, before you run out and grab the latest report generation package, make sure you request a database relationship diagram from Remedy. Gold mining in the ARS database without a map could prove hazardous to your job security.

notifier

The notification tool is Remedy's version of a desktop beeper (Figure 7). It provides a mechanism to notify ARS users of new schema entries, data modifications, escalations, etc.

The *notifier* is actually just a graphical interface which rests on a sophisticated client-server messaging scheme. Like all other components of ARS, the notification system is fully accessible via the application program interface (API). With a small amount of programming this system can be utilized to pass external application notifications to ARS users.

API

All of the tools we have discussed thus far are built on the API Remedy pro-

vides with Action Request System. The interface consists of a well-documented library of C functions and header files as well as a number of example programs. This interface provides the tools necessary to optimize a tracking system. Don't like the submit and query modes on the *aruser* tool? With the library you have the ability to write an integrated user tool. More importantly, the API can be used to integrate ARS seamlessly into an existing toolset.

Documentation

Remedy provides ample documentation for the administrator, user, and notification tools, with specific versions for each window environment. ARS also provides complete API and sample schema documentation. I have spent a considerable amount of time with the ARS suite of manuals over the last few years and so far have been pleased. The manuals are written with a focus on function rather than form. They explain how one would perform a necessary procedure rather than the intricacies of a particular tool.

Support

Action Request System support is provided for a yearly fee which is based on a percentage of the purchase price. Remedy provides online telephone support as well as e-mail inquiries. The engineers have always been reasonably responsive to service requests and I have yet to have any requests go unanswered. They must be using a pretty good tracking system? The product releases and patches are frequent enough to patch defects before you knew they existed.

Pricing

Rather than attempting to describe the pricing model in detail, let me just

say that a base server with no options and a three-user license lists for about \$6,500. You will certainly want to add a database engine if you plan to keep more than 5,000 records. For specific information contact Remedy directly.

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Mountain View, CA 94043-1102
Phone: (415) 903-5200
Fax: (415) 903-9001
Mailback Server:
infoserver@remedy.com

Conclusions

While you may not be able to drive the Action Request System directly out of the box, I doubt you will find yourself forcing your existing tracking model to meet limitations imposed by the Action Request System. If you are looking for a "ready-to-wear" helpdesk solution, the Action Request System is probably not the choice. However, if your goal is to find a tool that can be integrated into your existing business processes and can continually be optimized to meet future needs on a wide range of platforms and databases, then the Action Request System fits the bill. ■

Jeff Hodges is a Project Manager for Hewlett-Packard's Custom Services Division Research and Development Lab. The division delivers selective outsourcing services to HP customers. He manages a team of engineers who are responsible for providing tools and technologies that optimize the delivery of these services. He has worked for the last three years, both as an engineer and a manager, on the development of an integrated network and system management platform.

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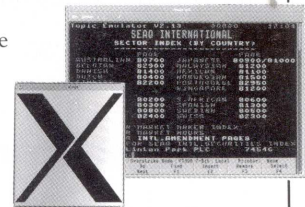
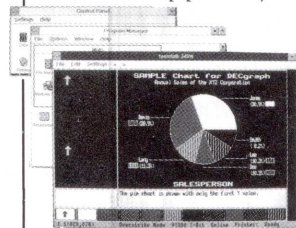
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Networking Today and Tomorrow

Robert Lee, *Results from Technology!*

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Whatever your interests, Toronto, site of Interex '95 Conference & Expo, August 14-18, offers something for you. It's a scenic city, with wonderful museums and a number of theaters, as well as attractions you won't find anywhere else.

You can view Toronto's harbor and picturesque islands and lagoons on a boat or yacht tour. Or take a driving tour to Niagara Falls with an inexpensive audiocassette guide.

On the other hand, you don't have to leave the city to find plenty to do. Visit the Metro Toronto Zoo, temporarily home to two one-year-old snow white lions and a tan sibling carrying the gene that may produce the pure white glow.

Or bone up on corsets at "The Etiquette of Victorian Women's Clothing" at the Royal Ontario Museum. The exhibit offers a remarkable collection of 19th-century costumes, garments, jewelry, furniture, and toys.



If your interests run to the present, explore New Age health and beauty oils—and mix your own scent—at Osmosis, a create-your-own aromatherapy shop.

Those who are star-struck can follow the new trend in Toronto by eating at a restaurant named after a celebrity. Have lunch at the Angie Dickinson, a sandwich at Bogey's, coffee at Twiggy, dinner at Mildred Pierce, or late-night cocktails at Betty's (named, until a lawsuit was filed, the Betty Ford Clinic!).

Between dinner at Mildred Pierce and cocktails at Betty's, you can enjoy an evening at the theater. The Gershwin musical "Crazy for You," running for more than two years, is still a hot ticket. Popular also are "The Phantom of the Opera", in its sixth year, and "Forever Plaid," in its second.

If you have any interest in rock, take the time some evening to visit the Hard Rock Cafe. The first of these cafes in North America, it dates back to 1978, when two Torontonians named their restaurant after the popular Doors album "Morrison Hotel/Hard Rock Cafe." By 1980, local groups and touring artists had begun donating autographed guitars, gold and platinum

records, album and tour jackets, and photographs to mount on the wall. Today the Hard Rock Cafe has Canada's largest collection of rock and roll memorabilia.

There'll be plenty to do when we get together at Interex '95 in August!

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ALT.SOURCES

XStar

A NOT-VERY USEFUL but nevertheless cute program found on this newsgroup in March was a program called *XStar* (Version 1.1). Written by Wayne Schlitt, *XStar* solves the famous astronomical *n*-body problem and displays the results in an X Window screen. As the author explains, "It starts by putting a bunch of stars on the screen, and then it lets the inter-body gravitational forces move the stars around. The result is a lot of neat wandering paths, as the stars interact and collide." When I was an astronomy major at the University of Arizona (more years ago than I care to remember), in one of my classes I had to solve the two-body problem (I think this is the only non-iterative case; in general one can only solve the *n*-body problem in an iterative manner).

Compiling the program was trivial. Use *xmkmf* to make the Makefile and then run *make* to build the program. *Xstar* includes several display options including one that has the output appearing in the root X window.

Using *archie*, I found a few places that have archived *XStar*. In the States you can get the software from *ftp.pacbell.com* at */newsarchives/alt/sources/XStar-1.1.0*. An alternate site in Europe is *ftp.tu-bs.de* at */ips/usenet/alt.sources/XStar-1.1.0*.

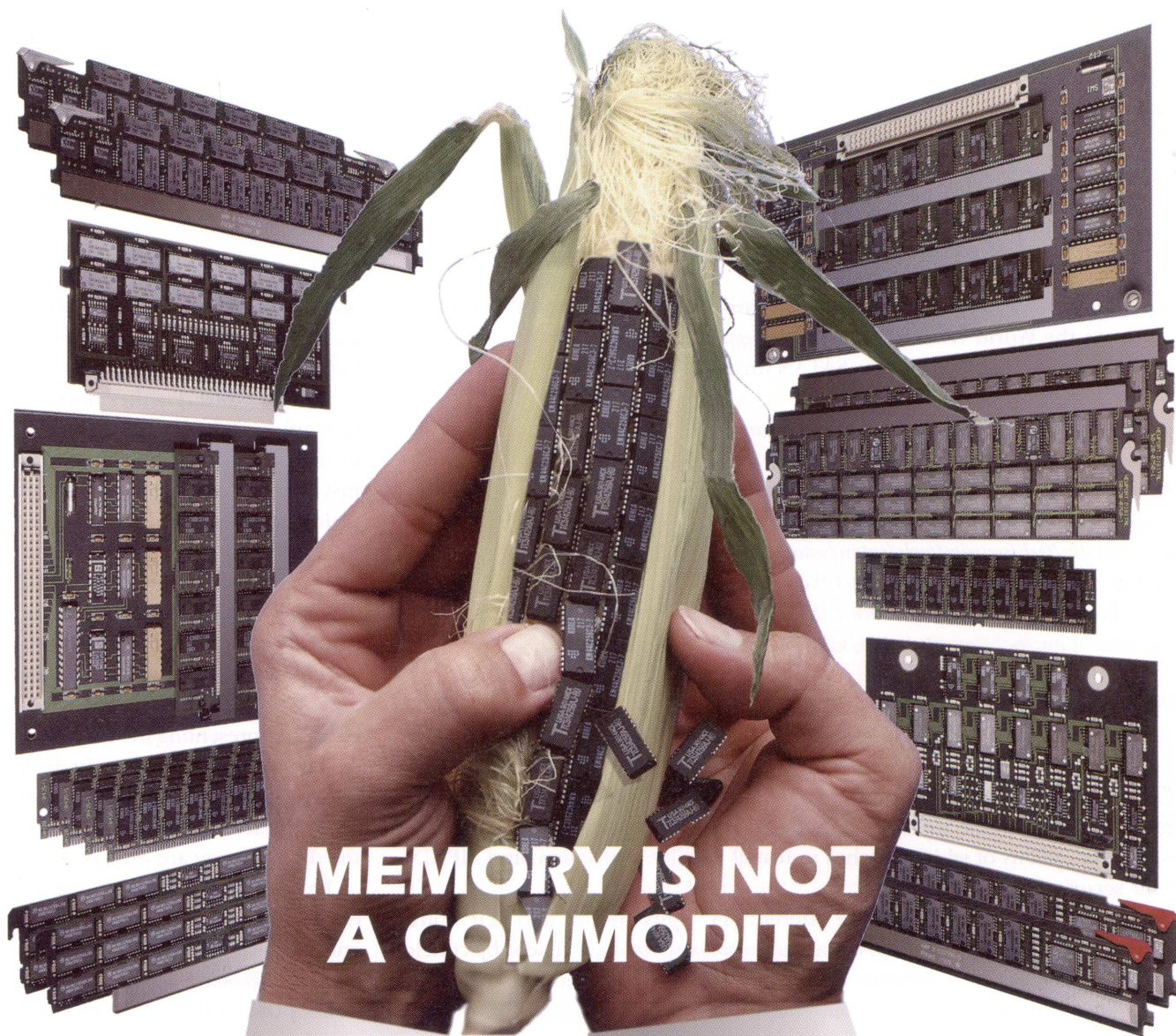
SATAN

Well, April 5 has come and gone. And the very (in)famous program SATAN has been released. If you haven't gotten a copy of SATAN yet, now is the time to download it. There has been a lot of press associated with this program. It is not the purpose of this column to expound on the benefits or horrors of having a program like SATAN loose in the world. The fact of the matter is, the program is out

there and it is being used. For the few of you who are not familiar with SATAN, it is a program written by Wietse Venema and Dan Farmer. SATAN is an acronym for "Security Analysis Tool for Analyzing Networks." The program remotely probes systems via the Internet and stores its findings in a database. The results can be viewed using an HTML browser such as Mosaic and Netscape. Since there is a decent chance that your Internet-connected network may be probed by SATAN in the future, you should run SATAN now and identify any security holes in your system that it finds.

I have been monitoring some of the Usenet traffic about SATAN on *comp.security.unix*. Some interesting comments have already surfaced. First, except for some isolated instances, the software compiles very easily on HP-UX systems (and on most other systems, too). Second, a number of people were disappointed with SATAN's abilities. With all the hoopla associated with the program, I guess everyone thought SATAN would uncover never-before-found security holes in their computer networks. But this wasn't the case. I think, however, that as time goes on, more and more people will be adding to the functionality of SATAN. Indeed, the program was designed to be very extensible.

On April 3rd, Hewlett-Packard released Security Bulletin #26, an advisory bulletin describing what customers should do to prepare their HP-UX systems for SATAN. Various patches that should be installed are identified. Suggestions are also made about network security changes that should be implemented. If you are not currently getting the *HP Security Bulletins* from the HP SupportLine mail service, send an e-mail message to *support@support.mayfield.hp.com* without a subject. In



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the text portion, enter the words "subscribe security_info". This information is also available via the World Wide Web at <http://support.mayfield.hp.com>

Here are a few ftp sites that offer SATAN for downloading:

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COMP.SYS.HP.HPUX

Not all goodies in Usenet are software. I found an interesting message in this news group about an HP-UX systems administrators' mail list that anyone can subscribe to. This mailing list's purpose is "to discuss matters related to HP-UX System Administration." Sample topics include debugging/problem solving, application porting, discussions of which patches to install to solve a problem, and HP-UX-specific security issues.

Two mailing list subscriptions are offered: (1) "hpux-admin" and (2) "hpux-admin_digest." To subscribe, send e-mail to majordomo@cs.ruu.nl. The subject field is ignored. In the text of the message itself, enter a line that looks similar to this: "subscribe hpux-admin joe@landmark.com". Substitute the actual mailing list you wish to subscribe to (choose one of the two items above). Use your name and address instead of mine! To get a list of the possible commands provided by this list server, enter "help" in the body of the message without anything else. An additional feature available is an archive of all summaries posted on the list. This archive is available via WWW software at address <http://www.cs.ruu.nl/hpux-admin-archive/>.

COMP.UNIX.SOLARIS

ncftp

Sometimes it pays to monitor many different newsgroups. At my company, I work with Sun Solaris systems as well as HP and IBM UNIX systems. For the collector of useful software, it is important to scan newsgroups that aren't always directly germane to your hardware. The software you download may be runnable on your HP-UX box. A case in point is a neat super-duper ftp program, call *ncftp* (the author says that it is pronounced nik-f-t-p). Since acquiring this program, I've basically stopped using the generic *ftp*. *ncftp* is so much better. This program can be accessed from <ftp.cs.unl.edu> in the `/pub/ncftp` directory. The latest version is 2.0.3.

What does this program give you? Well, for one thing it simplifies connecting to computers using "anonymous ftp." Just enter the command

```
ncftp somehost.com
```

and it will automatically communicate with the host, entering the name "anonymous" and your e-mail address as the password. Furthermore, it will remember each host you've connected to so you can reconnect by specifying just enough of the name to make it unique. It also remembers the last directory you changed to (it will automatically put you there again). If you used a real user name for a site, on subsequent connections it will just prompt you for the password to use.

The program uses *curses* to display a bar graph presenting the current status of a file transfer in progress. In the latest version, it has a "visual mode" that gives you a full-screen display of the files in the directory you are accessing.

Before installing the program, however, it would be worthwhile acquiring and installing the GNU programming utilities *readline* and *getline*. *ncftp* uses these utilities (if you have them installed) to give the user a history of his commands. Emacs-style editing of input lines is also available using these libraries.

Building the software on an HP-UX system is almost straightforward (actually, building it on my RS/6000 was trivial—the HP 9000/847 I used had some difficulty as you'll see). The instructions say that you need to run *configure* and perhaps edit the created file *Config.h*. The last step is the *make*. *ncftp* needs an ANSI-compliant C compiler (not the default compiler available with your HP system). Your two alternatives are either to use *gcc* or purchase one of the better HP compilers. I had *gcc* installed on my HP system, but for some reason the *configure* script wouldn't recognize it. I therefore defined and exported the environment variable `CC=gcc`. *configure* liked that but the created Makefile

still had problems. The solution then was to make two changes to the Makefile: (1) change the line `CC=cc` to `CC=gcc`; and (2) in the two definitions to `CFLAGS`, one commented out and the other not, simply comment out the uncommented one and vice versa. The make process then worked fine and `ncftp` was successfully built.

Where do you get `ncftp`? The authoritative location for the software is <ftp.cs.unl.edu>. It can be found in `/pub/ncftp as ncftp.tgz`. This file is actually a pointer to the real latest copy.

WWW

When I began this column, I didn't want to get involved with World Wide Web locations and Internet "surfing." However, I believe it is becoming more and more difficult not to mention some of the neat Web "goodies" available. Therefore, in each column (starting with this one) I will share with you a few of the special Web sites that I have found and saved. Please let me know if you approve (or even disapprove) of my pick list. Remember that to access these sites you will need a Web browser such as Netscape or Mosaic.

<http://stoner.eps.mcgill.ca/cgi-bin/webster>

If you need an online dictionary, then this site is for you. I cannot attest to the size of the dictionary, but so far, it hasn't let me down. Simply enter a word, and it will return its definition.

<http://www.cm.cf.ac.uk/Movies/moviequery.html>

This is the "Internet Movie Database," based in the United Kingdom, with pointers to the actual databases in various countries. Entering a movie title gave me the plot summary and various technical information, as well

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CIRCLE 51 ON READER SERVICE CARD

as audience rating information.

<http://www.hyperion.com/usx/>

This is "The Used Software Exchange." If you're looking to buy used software, browse through their database. If you have software you want to sell, register it here. It is all free. I used this service a few months ago to look for the CD-ROM-based PC game, "Return to Zork." There were two people selling copies of the game and I eventually bought a copy from one of them.

<http://support.mayfield.hp.com/>

I suppose we should be serious for at least one of these items. This is the official HP support home page called "HP SupportLine". It is jam-packed with all sorts of good information: patches, white papers, problem solving databases, support news, etc., etc. From here you can

even get to the Interex home page which is being developed. More good things there, too. ■

Joe Berry is a senior software developer at Landmark Systems Corporation in Vienna, Virginia. He is one of the authors of Landmark's performance monitor, TMON for UNIX. A former HP 3000 systems specialist for Hewlett-Packard, he has been in the computer industry for more 20 years. He can be reached at joe@landmark.com.

by Larry Headlund

I18N, continued

IN MY LAST COLUMN we examined internationalization, I18N for short, and decided that we really had to have two-byte representations to accommodate Asian languages with their thousands of characters. Now the fun begins. What two-byte scheme to use? If you are going to map all the characters from all the languages in the world into 64K bits, clearly many mappings are possible. Some will preserve the ASCII mapping for the lowest or highest byte. (Which reminds me that I can remember when the standardization effort that produced the 8-bit byte was a relatively new triumph. The nibble, half a byte, seemed an important unit also.) Some mappings will seem logical. Some will be computationally efficient. Some will encompass existing mappings for certain languages. Some, of course, will include several of these features. The struggles, arguments, and maneuverings to arrive at a standard are Homeric. And still continuing, with fierce partisans, particularly for Chinese.

Yes, Chinese is going to be the example again. By chance, it is the Asian language with which I am most familiar and the one for which I have had access to X and Motif tools. Simply, in Chinese each character is a word. There are words that are composed of more than one character and there are characters that appear only in combination, never alone, but the character-to-word mapping is fundamental. Characters are composed with smaller units called radicals, and classification by radical plus the number of strokes is the way dictionaries are organized. But since display on computers works on the unit of characters, the radicals are not relevant there.

There is some misinformation floating around about Chinese writing. One such factoid is that the characters are completely unrelated to pronunciation. A character's meaning is independent of pronunciation, so that speakers of Cantonese or Mandarin (or even Japanese for the common characters) can read and understand a character but pronounce it completely differently. However, many characters were created based on their pronunciation. For example, the characters for *horse*, *scold*, and *mother* are very similar because their pronunciation is similar. This linking between pronunciation and character is common but by no means universal. Most characters have no such link. When there is a link, sometimes the characters include a little box, the *ko*, symbolizing the mouth, to indicate that there is a sound part to the character. Don't count on it, though. Also, sometimes the pronunciation link is based on an obsolete pronunciation (this is an old written language after all).

Many of the characters are stylized pictures of the object in question. Some are clear and some have been abstracted out of all recognition. And there is the interesting case of words such as *ghost*, whose symbol is said to be a picture of a ghost, which as one commentator said is a statement hard to disprove.

Mandarin Chinese, the official language of mainland China, has four major tones which are important to meaning. That is, the same sound with a different tone equals a different word. This is how *horse*, *scold*, and *mother* are distinguished. Get the tone wrong and you could be asking someone if you can ride his mother. The

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four are a level tone, indicated by a - over the syllable, a falling tone, indicated by an accent grave (left to right falling accent), a rising tone indicated by an accent mark, and a falling then rising tone indicated by a mark like a small v. These marks are the ones used in Romanized PinYin, or the writing of Chinese in the Latin alphabet. Alert readers will notice that there is no way to enter these marks, crucial to meaning, on a standard keyboard. The workaround is to enter either 1, 2, 3, or 4 indicating the first tone, second tone, third tone, or fourth tone after the syllable. There is also a mapping between the sounds of the Chinese language, without tones, and letters and letter combinations.

This last mapping underwent a revision in the 1960s, as what in China did not. Older readers will remember when *Peking* became *Beijing* and the *T'ang* dynasty became the *Tang* dynasty without any change in the pronunciation of native speakers.

You might think we are all set with a mapping between syllables plus tones and characters. Not so fast, Bucky. Even with the tone markings, there are identical sounding words that have different meanings and different characters. Systems based on transcribed sound mapping must present the user with a set of Chinese characters to choose from. Now, most Chinese do not know the Romanized PinYin system. They know the pronunciation and the Chinese character, called *hanzi*. If you are going to memorize a new coding for your language to be used in computer input, why not use an efficient one? This is the reasoning behind the Five Stroke System. In this system, every *hanzi* is mapped to a unique five-character code. Very efficient, if you know the code. If you don't know the code, there isn't a reliable way to deduce what the code will be. You must resort to a dictionary. Both Romanized PinYin and five-stroke input methods have been implemented, along with several others. There is even one based on Morse code. The five-stroke method is the one most popular in mainland China. The learning curve for computer input is one reason why fax is much more popular in China than e-mail, even more so than in the West.

There is one other major issue with Chinese which must be mentioned. There are two forms of Chinese characters. One set is called the Traditional Chinese and corresponds to the forms used prior to this century and codified over the last couple of thousand years. The newer form, Simplified Chinese, has *hanzi* that are easier to write and is the form taught in mainland China and some other

Chinese speaking countries. However, Hong Kong Chinese, for example, learn and use Traditional Chinese *hanzi*. Some *hanzi* are identical in both systems and there is a one-to-one mapping between the two. I have encountered computer systems where documents entered in Traditional Chinese programs did not display correctly when examined by Simplified Chinese programs!

So how is all this handled in X and by HP? By the windowing system, not the application, of course. When you purchase the NLIO (National Language Input/Output) option for HP-UX and Chinese, you have the option of either Traditional or Simplified Chinese. When you want to enter some Chinese text, you press a magic key on your X terminal (the right extend/meta key) and a window is raised where you enter the coding, typically five-stroke, for the character. The correct Chinese *hanzi* then appears in the application's active text widget. This depends on two things. First, you must have the appropriate fonts installed. These are supplied with NLIO. Secondly, the application must have been compiled with the line

```
XtSetLanguageProc(NULL,NULL,NULL);
```

in its source code before the call to *XtInitialize()* or its siblings. You should include this line in all your code from now on. It is harmless if you are not doing internationalization and essential if you are.

If you are doing text manipulation in your code, there are some other changes to be made. Don't use *XmSTRING_DEFAULT_CHARSET* with your *XmString* functions, use *XmFONTLIST_DEFAULT_TAG*. Be very careful using character string variables. Remember, each character is now two bytes.

In my last column I mentioned a problem with my preferred programming style and internationalization. The problem is that since I use WCL, much of the functionality of my programs is defined in resource files. Since internationalization uses language-dependent resource files, I seemed to be on the horns of a dilemma. I would have to have functional code, not labels and such, duplicated for each language. This is a recipe for trouble when updates come along. X provides an answer, fortunately. I can use the *#include* syntax in resource files. so for a specification, say for a simple form, I will have two files, *addLine*:

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```
!      addLine: Template file for adding a line item
!      Public
.*labelQty.labelString:    Quantity:
.*labelCode.labelString:   Code:
.*labelPrice.labelString:  Price:
.MessageAddError:         Could not add line item
.MessageOutOfStock:       Item not available, Add anyway?
.MessageNotAvailable:     Item not available
!      Private
#include "addLineP"
```

which contains the user modifiable strings, and a second file, *addLineP*:

```
!      addLineP: Template file for adding a line item
!      Public
!      Private
.wcClass:                  XmForm
.wcChildren:               \
                           labelQty, Qty, \
                           labelCode, Code, Desc, \
                           labelPrice, Price, \
```

and so on.

The include algorithm searches relative to the directory of the calling file. It seems this means I haven't made much progress, since I still have distinct files for each language, unless I use absolute path names for the include statement, something I am loathe to do. But I finesse this by linking the private **P* files to one source file, so there is really only one file to maintain. ■

Larry Headlund is president of Eikonal Systems and has been working with commercial UNIX since 1982 and with X since 1987. He can be reached at lmh@world.std.com or 617 482 3345.



HP 1000 Guru

Q: I have recently upgraded to Revision 6.0/6.1 of RTE-A. Since that time I have had various programs, for instance DL and LS, abort with a Memory Protect or other error. Sometimes the program gives no error but does not give the expected result. Sometimes other running programs are aborted with an EM82 error.

These are all CDS programs. Is CDS broken at 6.0?

A: Well, something is broken, but it turns out it is not CDS. The problem is definitely related to CDS. A CDS program can be linked as a shared program. In fact, this is a primary feature of CDS programs, that multiple copies can all share the same code partition in memory, and each user has a unique data partition. This scheme is managed via a table in the operating system known as the Shared Program table. And like almost every table in RTE-A its size is determined by a parameter in the generation answer file.

The table consists of a five-word entry for each shared program, and the maximum number of shared programs is specified with the *SP* command in the generation. For example, a command of *SP,5* will allocate a table of 25 words and allow up to five concurrently executing shared programs.

Now you may be wondering what happens if, in this example, a sixth shared program is run. What happens is the operating system detects that there is no room in the shared program table, reports an FMP error -241, and then runs the program Unshared. Note that if the program is scheduled from a *CI, RU* command, the FMP error -241 will not be displayed. If the program is RPed from CI, then the FMP error will be reported by D.ERR as follows:

```
CI> rp dl
Can only run unshared. File: DL; Program: DL
```

At 6.0, ID segment changes were made. One of the biggest changes was the creation of ID segment extensions, which reside in XSAM. Prior to 6.0, the entire ID segment (48 words) resided in the operating system. In order to accommodate the EMA/VMA enhancements at 6.0, the ID segments had to increase in size. Since operating system size is always a concern, it was decided to move some of the ID segment information (the newly coined "extension") to XSAM. This also made the OS portion of the ID segment smaller (45 words).

So significant changes had to be made to *IDRPL* to create these new ID segments/extensions, and *all* programs had to be relinked at 6.0 since the previous ID segment format is not compatible with 6.0.

Now the problem: When *IDRPL* detected that the Shared Program Table was full, and proceeded to RP the program as Unshared, it "forgot" to initialize also the ID segment extension in XSAM. Now since the ID segment extensions in XSAM are not dynamically allocated (they are reserved at the beginning of XSAM) a program now has ID segment extension data from whatever program *previously* was using that same ID segment. Thus the results will be unpredictable. Not only that, if the *previous* program was using *SHEMA*, since this information is contained in

the ID segment extension, then when the incorrectly RPed program terminates, the OS may incorrectly update the SHEMA table, leading to potential EM 82 errors. In one case, the SHEMA table In-System count was decremented to 0, and because the SHEMA partition was not locked, the system deallocated the SHEMA partition of an active SHEMA program. Not very nice!

The easy workaround is to make sure you never exceed the maximum number of shared programs. The standard generation answer file has 30 shared programs allowed, which should be adequate. The problem can occur when you are trying to save OS space and reduce this value to 5 or less, or you have a lot of shared CDS applications.

This problem exists in both 6.0 and 6.1 and a fixed version of *IDRPL* is available.

Q: I am trying to set up anonymous FTP access to my RTE-A system. For security, I want user *anonymous* to have access only to a disk that contains the *LS* program, and not have access to all of */PROGRAMS*. I can't get *LS* to work.

A: The problem is that when *LS* is run from within FTP, *FTPSV* is looking for *FTPLS*. So, to make this work, the LU that user *anonymous* has access to should contain a directory, for instance, */PUB* that contains *FTPLS.RUN*. Also, make */PUB* the home directory for user *anonymous*. You can now use anonymous FTP to the 1000 and have controlled access to files and programs.

Q: RTE-A now supports 4-GB DDS tapes with compression. How do I turn on compression, and what kind of compression ratio can I expect?

I don't see any command in *FST* to enable compression; in fact, the *SD* command doesn't do anything and always returns 0 for the density.

A: Right, *FST* does not have any way to set compressed mode for the DDS tape drive. Nor can it tell you if the drive has compression enabled. But nevertheless, it is supported

and works using a control command documented in the *Driver Reference manual*. It's the same command used for setting the density and compressed mode for 7980S SCSI drives.

First a comment on density: DDS drives don't support changing density so they are genxed with DP2 = 0. This is how the system can tell if a 7980S or DDS tape drive is present. If it is genxed as 0, it cannot be changed to any nonzero value, though no error is reported. If DP2 is genxed to a nonzero value, it cannot be changed to 0 and the driver will reject any attempt to set it to 0.

So how do we enable compression? With the same *CN* command we have used for setting density on streaming tape drives.

To enable compression on a DDS tape drive use the following command:

```
CN,<lu>,15B,<Density>,<Compression>
```

where Density is 0 for the DDS (800/1600/6250 for the 7980S) and compression has the following meanings:

- 0—Use device defaults
- 1—Enable compression
- 1—Disable compression

The DDS drives with compression have hardware configuration switches internal to the mechanism. These switches are used to determine the following characteristics:

Device default:	Compressed or Standard
Control:	Changeable or Not

By default, the tape drive should come set for Standard mode, Changeable. The amount of compression depends upon the data being stored. Typical compression ratios range from 2 to 3 times; in other words, anywhere from 4 to 6 GB of data can be saved to a 2-GB DDS tape.

Here's a testimonial from a long-time RTE user testing a DDS drive with a 2-GB (90-meter) tape:

"I put 10 complete full backups on a 90-meter tape using compression. It ran out of tape on the 11th append. Each full backup was reported by *FST* to be 573,127,680 bytes. That's a total of 5,731,276,800 bytes with some tape left over, but not enough for another full backup."

Q: What are the physical limits on disk/LU sizes for RTE-A nowadays? Are we still limited to 32k tracks and 512 MB?

A: No. As of 6.1, larger disk LUs are supported by the SCSI disk drivers and also by the file system. For SCSI disks, the following limits apply:

Maximum Tracks	Maximum Sectors/Track
65,534	256

This allows for a LU of about 4,096 MB. But FMP limits the number of sectors per track to a maximum of 128, so a file system LU has a maximum size of about 2,048 MB. Additionally, old FMGR disk LUs are still limited to 64 blocks per track, or about 1,024 MB.

CS80 disk drives still have a limit of 32,767 tracks, but can have 128 blocks per track, so the maximum LU for a CS80 disk (and file system volume) is now 1,024 MB.

Q: So what is the largest DISK drive I can configure on an RTE-A system?

A: As mentioned previously, the largest LU that can be configured is 4 GB. And since we have a maximum of 255 LUs the theoretical largest disk drive that can be configured would be about 1,020 GB.

Of course, FMP limits disk LUs to be between 1 and 63, and 2 GB, so for FMP, the maximum disk size would be about 126 GB.

In case you were wondering, the starting block parameter is not even an issue, because we run out of LUs first. The starting block of a disk LU is a two-word value (unsigned integer) so can be in the range 0 - (65536*65536) or 4,294,967,296 blocks. This is about 1,024 GB.

Q: Is there a way to submit an HP 1000 or HP-RT SR via e-mail?

A: Yes. If you would like to submit a Service Request (SR) via e-mail, send a message to:

sr_submit@hpcurch.mayfield.hp.com

This is a valid address for all SRs having to do with the HP

1000 operating system as well as HP-RT and real-time HP-UX products such as GfOX, Softbench Link/1000, or the new Migration Tools.

If you do not have e-mail, you can mail the request to your local Response Center. Contact your local sales office for the postal address.

Or, if you have a support contract with the Hewlett-Packard Response Center, you can call through the same channels that you would use to ask a question. The Response Center will verify the problem and submit the Service Request reporting the problem to the lab.

You can submit Service Requests to report a problem or to request an enhancement to a product.

When submitting an SR, please provide the following information so it can be processed without delay. If the information is not complete, it will affect the timeliness of the response.

Real-Time Product Service Request Information

User name:

Company name:

Response Center Handle (if you have one):

Mailing Address:

E-mail Address (if you have one):

Phone number:

Is this a request for enhancement or report of a defect?

System type: 9000 model 74Xrt, 9000 model, or 1000 A/M/E/F series?

Operating system: HP-RT, RTE-A, or RTE-6

Operating system revision: RTE: 6.1 or 6100

HP-UX: 9.0X

HP-RT: A.02.01

Product: RTE-A, RTE-6, HP-RT, OTSrt, BPNrt, GfOX, etc.

Have any patches been installed on the system that has the problem? If so, what are the SR numbers associated with them?

Summary of Service Request:

For problem reports—

Provide detailed information that will enable the lab to duplicate the problem. A short piece of code demonstrating the problem is a great advantage. If you are sending e-mail, you can create a shar package containing all necessary files for HP-RT issues.

or

For enhancement requests—

Describe exactly what you would like to see in detail.

Impact to your business:

For problem reports—

Describe how this problem impacts your business by selecting one of the options below. Please feel free to add your comments describing the impact.

—Are you unable to use the product?

—Do you require a temporary solution?

—Are you able to use the product with limitations?

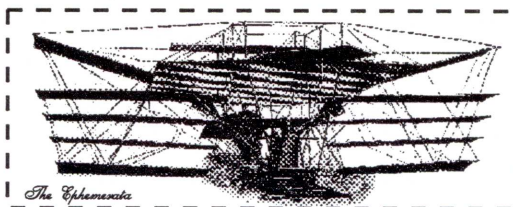
—Are you only slightly inconvenienced?

For enhancement requests—

Describe how incorporation of this request would affect your business. How would your application be improved? What benefits would you see if this request were incorporated? How would you be affected if it were not incorporated?

You will be sent an e-mail message or letter containing a reference number for each problem or enhancement to the product submitted. This number can be used to refer to the problem to obtain status at a later date. ■

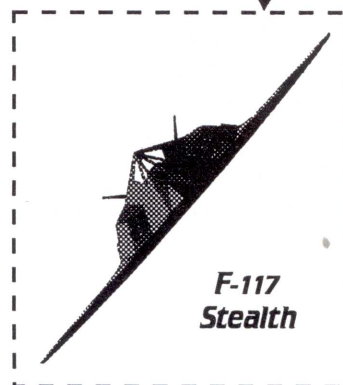
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F117	Tc	84	\$4400	



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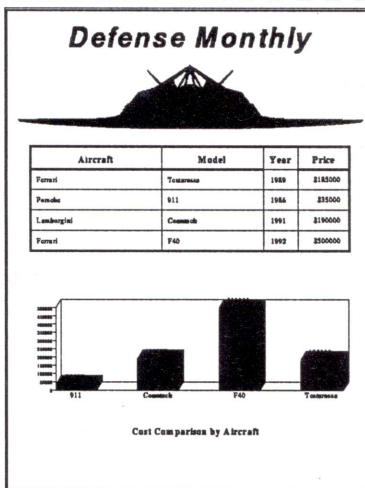
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CIRCLE 35 ON READER SERVICE CARD

Walt Boeninger works in the HP Response Center in Mountain View, California. He has been supporting the HP 1000 for 15 years.

Q: I have a 743rt processor installed in slot one of a VME crate. I do not have a disk connected to the 743rt. I want to autoboot from a specific HP-UX system on our LAN. The 743rt processor is also connected to our LAN. How do I make sure that the 743rt boots from the correct system when other HP-UX hosts are connected to the LAN as well?

A: The 743rt board computer supports BOOTP (BOOTstrap Protocol). BOOTP allows the 743rt to be booted over the LAN or VME backplane from a remote boot server. It checks the HP-UX host's `/etc/bootptab` file for an entry for the 743rt target system. This entry includes information about the LIF volume containing the ISL command `rtboot`. By default, it expects the LIF volume to be `/usr/tftpdir/rtbootlf`.

Set Up the HP-UX Host

The HP-UX system you want to boot from must have an entry in its `/etc/bootptab` file for your HP-RT system. This entry allows the HP-UX host to respond to the 743rt processor's query when searching the LAN for boot devices. The entry should look something like:

```
hprt1:\                (HP-RT hostname)
tc=global.defaults:\
bf=/rtbootlf:\
ha=080009abcdef:\      (HP-RT client's Ethernet hardware address)
ip=128.0.40.25         (HP-RT client's IP address)
```

Make sure the HP-UX system you want to boot from has the `/etc/bootpd` daemon enabled. The command:

```
(host)# netstat -a | grep boot
```

will return

```
upd  0  0  *.bootps  *.*
```

if bootpd is listening for bootp requests.

NFS services need to be running on the host system. It should be set up as both NFS client and server.

Modify the `rtbootlf:AUTO` file to contain the correct boot string for your kernel. (See the question below for information about the location of the correct LIF file and assistance modifying it.) For example:

```
rtboot -a -rramdisk /rt743.lan.ram.2.03
```

Put the modified LIF file (`rtbootlf`) in `/usr/tftpdir` on the HP-UX host system.

Put the HP-RT kernel file that you want to boot into `/usr/tftpdir` also. The kernel file and the LIF file cannot be symbolic links. They must be regular files.

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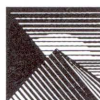
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CIRCLE 11 ON READER SERVICE CARD

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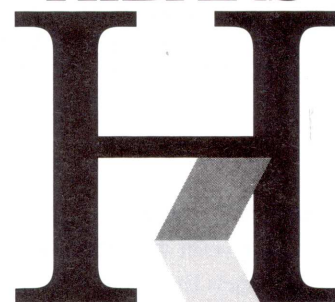
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CIRCLE 28 ON READER SERVICE CARD

Set Up the HP-RT Client

Power on or reset the 743rt. Stop any autoboot process that might currently be set up and any search for boot device process by hitting [Esc] as prompted. You will see the MAIN MENU of the Boot Console Handler (BCH).

- Select (2) for Path Configuration.
- Select (1) for Primary Boot Path.

The system will scan for devices that are available to boot from. If you have the HP-UX system set up correctly, it should come up as an available Device Path. If it does not, refer to the *HP-RT System Administration Tasks Manual* (Part No. B3127-90005), Appendix B, for information on troubleshooting BOOTP. Also check to make sure the HP-UX system is set up properly as a host for HP-RT.

- Select the Key corresponding to the network address of the HP-UX system you want to boot from. It will now be the Primary Path.
- Go back to the MAIN MENU.
- Select (3) for MODE CONFIGURATION.
- Select (1) for Boot Search Control.

Make sure that Primary Path is the first selection in the list. Return to the MODE CONFIGURATION MENU.

- Select (5) for Control Flags.

Make sure that Auto Boot Select is set to YES and that Interactive ISL is set to NO. These flags are toggled by selecting the Key number of the desired item. Go back to the MODE CONFIGURATION MENU.

You should now be ready to reset the 743rt. You can do this from the MODE

CONFIGURATION MENU by selecting Key 77 Reset the System. Your 743rt should now autoboot the kernel you have specified in the *rtbootlf:AUTO* file that is in */usr/tftpd* on the HP-UX system you want to boot from.

Refer to the *HP-RT System Administration Tasks Manual* for more information on autobooting the 743rt system. Refer to the *Model 743 VMEbus Board Computer Service Manual* (Part No. A2636-90030) for more information on configuring the Model 743rt.

Q: I am attempting to modify my *rtbootlf* file so that I can autoboot my 743rt HP-RT operating system at revision A.02.0X. I performed:

```
# lifcp rtbootlf:AUTO auto
```

and edited the file *auto* to reflect my new *rtboot* command. I then removed the old *rtbootlf:AUTO* with

```
# lifrm rtbootlf:AUTO
```

and copied the new one into the *rtbootlf* file:

```
# lifcp -r -T-030001 -K2 auto rtbootlf:AUTO
```

I set my primary path to the LAN address of the host HP-UX system and set the Control Flags Auto Boot Select = YES and Interactive ISL = NO. I then reset my system, but it would not boot. What is wrong?

A: BOOTP on the HP-UX host expects the AUTO file to be the *first* file after "ISL." Unfortunately, current methods of modifying the *rtbootlf:AUTO* file are inconvenient in that once the AUTO file has been modified, copying it back to *rtbootlf* will not automatically replace the original AUTO file.

Here is a sample *rtbootlf* file:

```
#lifs -l /usr/tftpd/rtbootlf
```

volume HPRT	data	size 15615	directory size 2	94/06/21 11:15:52
filename	type	start	size implement	created
ISL	-12800	16	240 0	94/06/21 11:15:52
AUTO	-12289	256	1 0	94/06/21 11:15:52
RTBOOT	-12928	264	688 0	94/06/21 11:15:52
ODE	-12960	952	464 0	94/06/21 11:15:52
SYSLIB	-12801	1416	656 0	94/06/21 11:15:52
MAPFILE	-12804	2072	32 0	94/06/21 11:15:52
IOTEST	-12802	2104	832 0	94/06/21 11:15:52
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LDIAG	-12802	4840	5760 0	94/06/21 11:15:52
PERFVER	-12802	10600	624 0	94/06/21 11:15:52
CRAYON	-12802	11224	592 0	94/06/21 11:15:52

In order to use just the LIF commands to make this change, it is necessary to remove all of the entries following the ISL entry and replace the remaining entries in the appropriate order. As this is quite cumbersome, an unsupported utility has been created to make the change much easier. It is called *autofl()*. The utility has the following usage:

```
# autofl
Usage:
    autofl -r <filename>
    autofl -w <filename> "<string>"
```

Where:

-r specifies a read from the autofile.
-w specifies a write to the autofile.
<filename> is the name of an HP LIF (Logical Interchange Format) file.
autofl is an *unsupported* utility.

On the HP-UX host, the LIF file for HP-RT is one of the following:

```
$HPRTroot/usr/lib/rtbootlf
$HPRTroot/usr/lib/rtbootlf.740
$HPRTroot/usr/lib/rtbootlf.743
```

There are two versions of the utility: one for HP-RT disk-based systems and one for HP-UX. The functionality is identical. The path to the files is as follows:

```
HP-UX: $HPRTroot/hpux/bin/autofl
HP-RT: /usr/contrib/bin/autofl
```

Be aware that both versions must run on normal files (i.e., no raw device files). For example, the following would not work:

```
/usr/contrib/bin/autofl -w /dev/rsd6 "rtboot -r scsi.5 /hp-rt"
```

Also note that the HP-UX version of *autofl()* will be useful for any 743i processors executing HP-UX and using BOOTP, where the AUTO file within the HP-UX LIF file needs to be modified.

You can obtain these utilities by contacting the Hewlett-Packard Response Center.

Q: I am trying to autoboot an HP-RT kernel on my 743rt processor. I modified the */usr/tftpdir/rtbootlf:AUTO* file as directed to contain:

```
rtboot -a -rramdisk /testkernel
```

I then created */usr/tftpdir/testkernel* using the *HPRTadm* script. When I boot */usr/tftpdir/testkernel* manually from ISL, it works fine. When I attempt to autoboot using */etc/reboot*, I find I am autobooting a different kernel, */hp-rt*. Why is this occurring?

A: You modified the file */usr/tftpdir/rtbootlf* to boot a different kernel during autoboot. If you then used *\$HPRTroot/hpux/adm/HPRTadm* to make the new kernel, your modified */usr/tftpdir/rtbootlf* file was overwritten by the script with the file

```
$HPRTroot/usr/lib/rtbootlf.743
```

This file as shipped contains:

```
rtboot
```

which attempts to boot the file */hp-rt* by default. The kernel that is now autobooting is probably */usr/tftpdir/hp-rt*. You should make the new kernel first and then modify the */usr/tftpdir/rtbootlf* to reflect the new kernel name.

Q: I would like to be able to have my 743rt system autoboot from the Primary Boot Path. If this path is not available, however, I want it to try to boot from the Alternate Boot Path. If the alternate is not available, I want the 743rt to check the primary path again to see if it has become available. Is this possible?

A: You can use the 743rt Boot Console Handler (BCH) to configure the 743rt to respond as you have described. This is the menu that is displayed when you turn on or reset the 743rt. If the 743rt system is already set up to autoboot, you

need to press [Esc] to discontinue the autoboot sequence and get to the MAIN MENU.

Ensure USER MODE

- From the MAIN MENU select (88) for Change Mode.

You need to be in USER mode. The OPERATING MODE menu will tell you the current mode. If it is not in USER mode, select USER mode and return to the MAIN MENU.

Select a PRIMARY and ALTERNATE Boot Path

This allows the user to store the address for a specific device to boot from.

- From the MAIN MENU select (2) for Path Configuration.
- Select (1) for Primary Boot Path.

The system will scan for available devices that it can currently boot from and display each one preceded by a Key number.

- Select the path that you would like to be your Primary Boot Path.*
- Select (0) to return to the Previous Menu.
- Select (2) for Alternate Boot Path.

The system will again display the devices that are currently available to boot from. Select the Key number for the selection you want for the Alternate Boot Path.

- Select (0) to return to the Previous Menu.
- Continue selecting (0) until you return to the MAIN MENU.

Set Up Boot Search Control

This allows the user to select the order in which to search for devices to boot from. You can specify boot attempt from the Primary Path first, the Alternate Path second, and even a SCSI device third, if you wish.

- From the MAIN MENU select (3) Mode Configuration.
- From the MODE CONFIGURATION menu select (1) for Boot Search Control.

The BOOT SEARCH CONTROL menu will display the

current mode, a Search Order List, and a list of Available Modules. The current mode should now be USER. The entries in the Search Order List are in the order that the 743rt will use to attempt to autoboot the system. The entries in the Available Modules are the other selections that can be added to the Search Order List. Add a selection to the Search Order List by simply selecting the Key number of the Module you want to add to the list. You will see it move from the Available Modules list to the Search Order List. To remove an entry from the Search Order List, select the Key number of the Module to remove. You will see it move from the Search Order List to the Available Modules list.

- Select (0) to return to the Previous Menu (MODE CONFIGURATION).

Set the Control Flags

This is the menu that allows the user to set flags specifying Auto Boot, non-Interactive ISL, and Repeat Scan for Auto Boot devices.

- From the MODE CONFIGURATION menu, select (5) Control Flags.
- Set Auto Boot Select to YES.
- Set Interactive ISL to NO.
- Set Repeat Scan for Auto Boot devices to YES.

When Repeat Scan for Auto Boot devices is set to YES, the 743rt system will try to boot from the device that was specified first in the Search Order List. If it is not available, it will try the second device on the list. It will try each device in turn until it gets to the end of the Search Order List. If no devices are available, it will go back to the top of the list and repeat the attempts indefinitely or until a device becomes available.

- Select (0) to return to the Previous Menu.

You will see that the Control Flags have now been edited.

- Select (55) to Save ALL Changes.

Set Up the Boot Devices for Autobooting

Make sure the AUTO file in the LIF volume on each of the boot devices has been modified to include the bootstring for the correct kernel from which to boot for that device. For example, if you are going to boot from a SCSI disk, the `/rtbootlf:AUTO` file on the disk should have the runstring to boot a disk-based

kernel that exists on that SCSI disk. If you are going to boot from a device on the LAN that has been defined in the Primary Path, the `/usr/tftpd/rtbootlf: AUTO` file on that HP-UX host must have the runstring required to boot a ramdisk-based kernel that exists on that same HP-UX host system.

Now when you power on or reset your 743rt, it will attempt to boot from devices in the order specified in the BOOT SEARCH CONTROL list and it will continue to scan the list until a boot device becomes available. ■

HP-RT Operating System questions are answered by Anita Harris, a support engineer in the HP-RT Expert Center. She has worked with Real Time systems for eleven years as a customer, a Real Time Response Center Engineer, and HP-RT Expert Center Engineer.



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CIRCLE 56 ON READER SERVICE CARD



CSL Perspective

"Change is a slow-moving vehicle."

—Andy Gray

ANDY, A COLLEAGUE OF mine, recently shared this insight at a meeting of our church council. We're going through a tough transition as our church moves in a very new direction. It struck me that in many ways, change sometimes takes time, usually more than we would like. Sometimes it just lumbers along like a hay wagon on a narrow country road. We frequently become impatient with its slow pace, but passing the wagon is out of the question, so we just resign ourselves to following it. Watching that tractor finally pull over and seeing the open road ahead can be very exhilarating.

As I said in previous columns, Interex and InterWorks, the HP Workstation Users Group, have been forging a new relationship, culminating in a formal merger that becomes effective in August. I have been fortunate to have been part of this activity from its earliest days, committed to the belief that we can do more together than we could do separately. A merger will benefit all HP users, especially the emerging commercial HP-UX community. Users in the commercial area share some common characteristics. They usually are changing their computing environment from one that is proprietary to HP-UX. The skill levels of many of the key technical people are just beginning to mature and they usually run mission-critical applications on their systems. These users also realize that they cannot be very successful in the HP-UX world without a lot of learning, encouragement, and mentoring, which is precisely what a good users group can offer. The growth in UNIX computing, especially from HP, shows no signs of levelling off; therefore it is

increasingly obvious that Interex has a big opportunity to address.

All the more reason for these two premier HP users organizations to merge at this time. InterWorks members bring a wealth of technical expertise and experience to Interex; both will be extremely important for the future. This is not to say that Interex hasn't had a presence in the UNIX world; it's just been a secondary thrust for some years. Well, no longer. Since early this year, teams of Interex and InterWorks members have been meeting and implementing transitional activities to bring us toward the common goals of serving you, the HP computer user. The Contributed Software Library is part of this transition and we're pooling our efforts to improve the library offerings.

The Interex and InterWorks libraries consist of a large collection of software, utilities, and data files. The collection at Interex spans MPE, RTE, and HP-UX; InterWorks is exclusively HP-UX and Domain/OS. Since the extent of our common interest is focused primarily on HP-UX, we will be working on ways of leveraging each library to improve the quantity and quality of contributions. We will also be putting the HP-UX collection at Interex online, available via anonymous ftp, in a form similar to the InterWorks library.

Since many of the contributions that we have released have been gleaned from various public sites, we believe that our added value is in the testing, documentation, and training that we can provide. This is the primary motivation for this column as well as many of the fine articles in *hp-ux/usr*. We realize that many of our readers (and members too) are still getting their feet wet and need some guidance and help. You can expect to

see the combined organization being able to provide an expanded technical knowledge base, primarily through volunteers and utilizing our Online Services, conferences, and publications to deliver information to the members.

We expect that Online Services will be a key mechanism to deliver the CSL to you. But OLS (can't live without an acronym) will be much more.

Conferences, Publications, Advocacy, Special Interest Groups, and Membership will be represented and accessible. But we haven't forgotten about the RTE or MPE users during this transition. In the future, the entire CSL will be more accessible and easier to navigate. This is especially important as more MPE users gain experience with HP-UX and POSIX. The RTE users should also benefit as HP increases the support migration from RTE to HP-UX or HP-RT.

As Interex continues to build up its online strategy, we welcome any input or comments that you would like to share. Please drop me a note; my address is gerwitz@interex.org or can be found at the conclusion of this column. If you see yourself fitting into the activities of Interex, please consider offering your time and talents. Interex is an organization of users helping each other, and much of what goes on is the result of the dedication and tenacity of scores of people just like you. We are fortunate to have a fine staff in the Interex office to assist us, but without you, the member, very little would be accomplished. If you believe you have a contribution to make, please let us know. Call or write to the Volunteer Development Committee Co-Chairmen Lou Mills (mills_louis@interex.org) or Anny Young (young_anny@interex.org).

Following up on the installation tutorial from the past several columns, I

wanted to let our members know of a contribution on the 1994 tape that could be a blessing in disguise.

Since many of our members are using HP-UX servers to host client-server applications, they frequently do not have an ANSI-C compiler. In addition, many of our members do not have much experience with C or the various software development tools that UNIX systems are known for. The HP-UX community is fortunate that someone has ported the GNU C Compiler (*gcc*) from the Free Software Foundation and provided it in binary form. You will find it in contribution f0041. It runs on Series 700 workstations as well as on PA-RISC 1.1 Series 800s (won't run on 825, 835, etc.). With it, you can compile most, if not all, of the contributions. Of course, if you're fortunate to have the HP compiler you may not need *gcc*. The installation is straightforward and it seems to be working well, given the many positive reports I'm hearing.

Finally, I would like to encourage those of you who are planning to attend Interex '95 in Toronto, to bring along a swap tape contribution.

The Swap Tape is a tradition at the Interex conferences. Attendees bring software to contribute to the library. We take all the contributions that are submitted, index them, and give you back the entire swap collection on your tape. It is a dynamite way not only to showcase your work but also to share any gems you might have found on the Net. Have you downloaded a newer version of any of the previous CSL programs? Why not bring that too! As time permits, we'll try to have some of these contributions available in the Interex booth on the show floor. For those of you who are unable to contribute something, the Swap Tape

will be available for sale as well.

Speaking of the booth, the CSL committee is looking for people to help us answer questions and talk to users in the Interex booth in Toronto. You don't have to be an expert in technology, just someone able to share your experiences with fellow users. If you can spend just a few hours, we'll be sure you're prepared to help us showcase the Online Services and our World Wide Web server. It's a great time and an excellent opportunity to meet others in our users group.

Toronto is a fabulous city. You won't want to miss it. ■

Paul Gerwitz is chairman of the CSL/HP-UX committee and is a technology specialist at Eastman Kodak Company in Rochester NY. He can be reached at (716) 477-3067 or e-mail at gerwitz@interex.org or gerwitz@kodak.com.



Industry Watch

Two bits, four bits, six bits, a dollar ... how about 64 bits for \$50? That's what it takes to get a sample of MIPS' new 64-bit RISC processor. With partner NEC, MIPS is pushing its new 100-mHz MIPS R4300i toward the promising consumer interactive media market, claiming to bring "Pentium-class performance to embedded applications for a fraction of the price." With a full complement of 64-bit registers, data paths, and buffers, MIPS is reporting performance of 60 SPECint92 and 45 SPECfp92 in its latest benchmarks.

If you want to get technical, though, the performance from MIPS is just a *blip* compared with Digital's BIPS (Billion Instructions Per Second) chip. Used in the Alpha departmental and enterprise servers, The 300-mHz Alpha 21164 is being touted by Digital as "the world's

most powerful microprocessor." This little number serves up 300 SPECint92 and 500 SPECfp92 according to reports from Digital and is complemented by 64-bit database technology from Oracle.

The company claims applications will run 200 times faster than on current 32-bit systems. And if you're looking for memory, IBM's offering this spring was a chip off the old blue block—a CMOS-based memory chip the company says will provide a memory access time of 2.5 nanoseconds. This 1-megabit synchronous static random access memory chip is said to match the speed of the fastest microprocessors out there (oh, up to 200 mHz, that is) and is priced to move at \$110 in quantities of 1,000. So, IBM, "thanks for the memory!"

James H. Gamble

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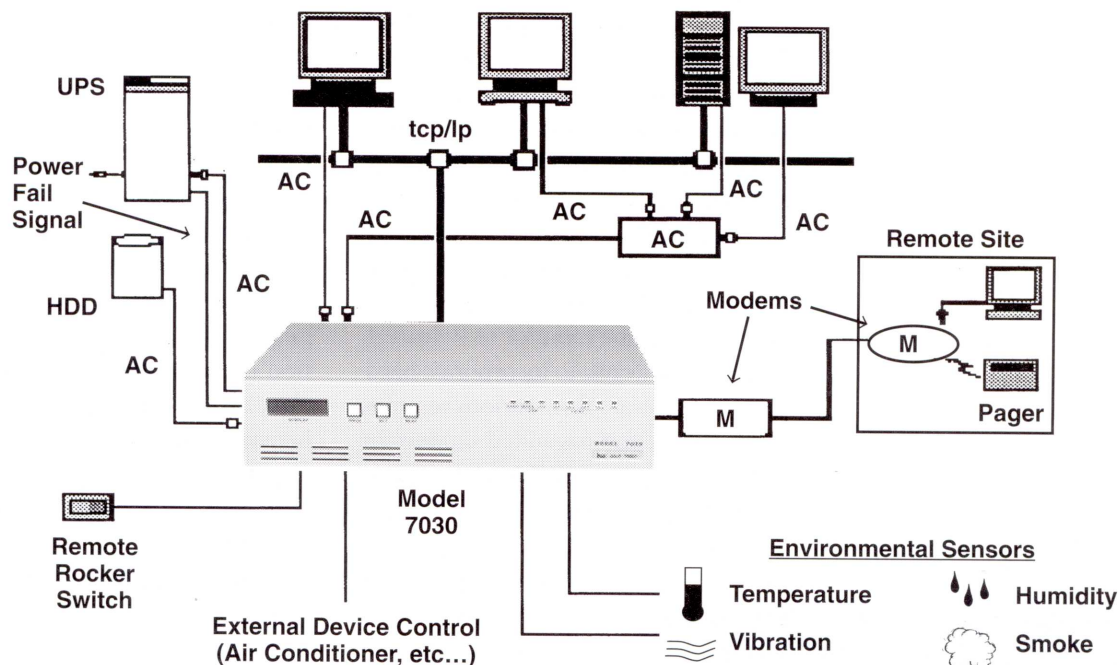
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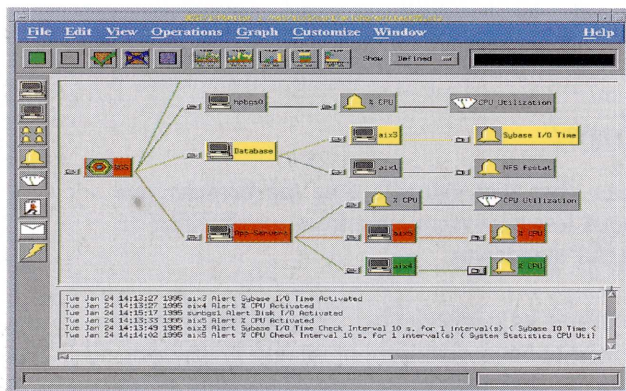
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Product Focus

BEST/1 for UNIX Release 4

As the number of organizations deploying large, complex, multivendor systems grows, so does the importance of performance management. BGS Systems, Inc.'s BEST/1 for UNIX, a suite of performance and capacity management products, addresses this need. Recognizing the complexity and business-critical nature of large systems, BGS has added a real-time monitor to Release 4. Recognizing trends to incorporate hardware and software from various vendors, the company also has added support for Oracle and Sybase RDBMSs, as well as for SunOS 4 and Solaris 2.x (HP-UX is already supported).



Mike Toomey, BGS' senior manager of product marketing, noted that Best/1 for UNIX "is really consistent with the mainframe products and with those for the AS/400 that we have." The product consists of the management console, on which activity is monitored, and the configurable agent

on each system to be managed. The configurable agent collects data only once, "an important efficiency factor," Toomey added.

Once data is collected, it is sent from the managed node to a combination of the software components that comprise BEST/1 for UNIX: BEST/1-Monitor, BEST/1-Visualizer, and BEST/1 Predict. A user running a combination of these three packages on the monitoring system can look at multiple nodes or single systems in either real-time, historical, and/or what-if contexts.

BEST/1-Monitor, which resides on UNIX, can be used on a stand-alone basis or combined with BEST/1-Visualizer and BEST/1-Predict. BEST/1-Monitor enables administrators to use various criteria to determine when alarms are sent to monitoring consoles. BGS placed emphasis on flexible configuration of policies, because "what you really want to know is when a crisis happens," said Toomey. Policy configuration options include the ability to set alert thresholds higher on days when heavier-than-normal activity is anticipated. Through a point-and-click interface, users can generate real-time graphs on the system.

The information collected in real time, as well as that collected in off-peak times, is stored in the historical database, BEST/1-Visualizer. Visualizer resides on a PC, which, noted Toomey, enables users to "combine UNIX data with performance data from midrange or mainframe systems" for an enterprise-wide picture of performance trends, as well as comparisons of systems and applications throughout the enterprise. This data can be viewed, using various data selection criteria, in three-dimensional visual presentations. By clicking on specific areas within a 3-D graphic, users can obtain greater detail on a particular aspect of a report.

In addition to informing administrators of present and past performance considerations, BEST/1 provides administrators with a glimpse of the future through BEST/1-Predict's "what-if" modeling. Users can optimize performance by projecting how a current trend or future change will affect one machine or an entire domain. It can be used to accurately size applications, test the effect of tuning alternatives, and plan capacity.

These components "take you through the whole spectrum" of performance monitoring, and the fact that they come as an integrated product is unique. "A number of people talk about having these capabilities, but none has it yet."

With Release 4, BEST/1's real-time alarm conditions can be forwarded to the BEST/1-Monitor console(s) or to frameworks such as OpenView, SunNet Manager, and IBM NetView/6000. When thresholds are passed, people on OpenView stations, for example, can be alerted and can take action within OpenView. Real-time notification can be used to indicate when a disk is full, when a system is out of CPU cycles, or to alert an administrator that a heavy usage period is occurring, such as "Ten users are on a particular device and it's Tuesday," Toomey suggested.

He considers OpenView and other frameworks as complementing rather than competing products to BEST/1, because "something like OpenView typically has a few performance functions on it. Our role is to handle the full spectrum of performance and capacity management." He added that any "overlap" of capabilities would most likely occur only in low-end performance monitoring features. Toomey says the advantage of systems administration frameworks is that "they provide a consistent framework" to integrate specialized products such as BEST/1.

The latest release also supports Oracle and Sybase, enabling BEST/1 for UNIX to gather and analyze RDBMS internal performance statistics. The product-specific RDBMS capabilities collect detailed information from the Sybase System Tables and Variables and from the Oracle V\$ Performance Tables to provide a user-oriented view of systems

resources in client-server applications. Management and analyses can be by specific performance details, as well as by application or user across multiple nodes. Informix capabilities are in development and other RDBMS products are planned. In addition, BGS plans to add support for Windows NT and to provide extensive network measurement and reporting capabilities in future releases.

Such interest in integration with other vendors' hardware, management framework applications, and database systems is not surprising, considering that BGS boasts alliances with HP, IBM, Sun, Oracle, Sybase, Informix, and Tivoli, among others. HP has named the company an OpenView Partner, an HP Performance Software Collection Partner, and a member of the developer's program for PA-RISC.

BEST/1 for UNIX Version 4 is avail-

able now. Console software prices start at \$25,000. Agent software costs less than \$1,000 per node, and prices vary.

Contact BGS Systems, Inc., 128 Technology Center, Waltham, Massachusetts 02254-9111, phone: (617) 891-0000, fax: (617) 890-0000, e-mail: best1@bgs.com. ■

Michelle Pollace, the New Products editor for hp-ux/usr, writes Product Focus.

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CIRCLE 33 ON READER SERVICE CARD



New Products

Warehouse and Distribution Management

McHugh Freeman has announced DMplus, a real-time, radio frequency-based management product developed in UNIFACE for managing warehouses and distribution centers. UNIFACE is a second-generation client-server application development environment.

DMplus is a comprehensive set of applications that companies can use to manage warehouses and distribution centers. DMplus connects to handheld units that allow users to enter data from the warehouse and distribution center floor through barcode readers. Running on a Windows PC, DMplus communicates this data to UNIX servers by radio frequency. Its primary functions include: appointments, yard management, receiving, putaway, wave planning, replenishment, picking, shipping, inventory management, location management, and productivity reports.

Contact McHugh Freeman & Associates, 20975 Swenson Drive, Suite 400, Waukesha, Wisconsin 53186, phone: (414) 798-8600.

Standard Template Library

ObjectSpace, Inc. has announced its new, enhanced version of the Standard Template Library, the accepted ANSI/ISO standard for the C++ programming language. ObjectSpace's STL <Toolkit> offers multithread extensions, including read and write locking, and is the only version of STL that is compatible with cfront-based compilers. It supports Windows, UNIX, or OS/2 environments.

STL, originally developed by Alex Stepanov and Meng Lee of Hewlett-Packard Laboratories, is a powerful, efficient, and flexible set of reusable collections and algorithms. It was

accepted in July 1994 by the ANSI/ISO Standards Committee as a part of the emerging international standard for the C++ programming language. HP placed its implementation of STL in the public domain as a service to the programming community. ObjectSpace produced an enhanced version of STL.

STL <Toolkit> comes bundled with ThreadKit, ObjectSpace's cross-platform library for multithread development. ThreadKit may be used to control access to any STL collection in a multithread environment.

The STL <Toolkit> was intended to be bundled free with ObjectSpace's product ObjectSystems, or independently for an introductory price of \$149.


Contact ObjectSpace, Inc., 14881 Quorum Drive, Suite 400, Dallas, Texas 75240, phone: (214) 934-2496, fax: (214) 663-3959.

Print Controller

Unisys Corporation has announced Unisys Distributed Enterprise Print Controller (DEPCON), client-server software that enables UNIX users and users of other popular systems to print at any level of an organization at any location.

DEPCON features bidirectional file distribution capabilities, broad support of open communications protocols and common printer languages, and wide range of print and administrative tools. Users can implement centralized or decentralized print processes, distribute print files across enterprise networks, and print with consistent uniformity in mixed computing environments that include both Unisys and non-Unisys systems, such as IBM AS/400 minicomputers, UNIX systems (including HP 9000s), and others.

Unisys DEPCON server operates on a



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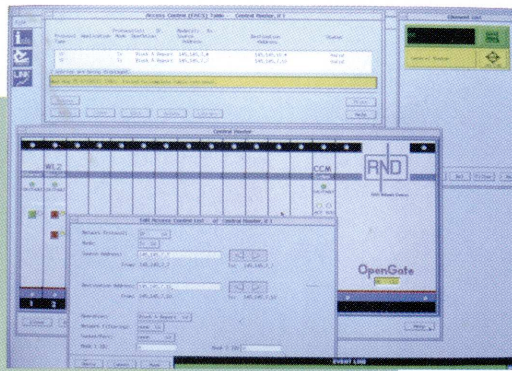
Rad Network Devices, Inc. (RND) has announced Facility for Access Control and Security (FACS) for its OpenGate multi-protocol routers. This security package ensures secure LAN/WAN internetworks through user-defined specific control criteria for any protocol including IP, IPX, DECnet, SNA, and NetBIOS.

FACS controls which device can communicate with other devices based on protocols and applications. Its optimized filtering mechanism examines the contents of each packet, permitting address or route filtering to take place all the way up to the application level. A reporting facility provides detailed information on attempted access violations.

It allows the originating router closest to the sending station to perform an access check while preserving bandwidth and server CPU resources. The optimized access tables maintained by FACS make the packet-checking procedure more efficient than the masking method. A simple GUI allows user-defined filtering criteria for each of the protocols.

FACS is included in the standard software package for RND's OpenGate router. It is free to customers with a current software license. FACS runs in conjunction with RND's MultiVu network management software.

Contact RND, 3505 Cadillac Avenue, Suite G5, Costa Mesa, California 92626, phone: (714) 436-9700, fax: (714) 436-1941.



Facility for Access Control and Security (FACS)

Motif Implementation

IXI Corporation, a subsidiary of The Santa Cruz Operation, Inc., has expanded its IXI Premier Motif software to support HP platforms, in addition to IBM and Sun. The software is designed so that developers never need to change their code because of cross-platform inconsistencies in the underlying Motif toolkit.

Quarterly upgrades are available on CD at no extra cost. The January 1995 update includes a CDE Migration Module, which contains the first publicly available CDE Widgets, SpinBox, and ComboBox. More CDE widgets will be added as they become more stable. In addition, IXI's Wintif libraries are now bundled.

IXI Premier Motif is said to be the only Motif code identical across platforms. It is based on OSF/Motif 1.2, as mandated by the COSE CDE standard. IXI has added numerous bug fixes, many of them not found in any hardware vendor's Motif implementation, IXI notes.

The IXI Premier Motif Developer's Pack is priced per user, starting at \$695, and includes quarterly upgrades for one year.

Contact IXI Corporation, 400 Encinal Street, P.O. Box 1900, Santa Cruz, California 95061-1900, phone: (408) 427-7700, fax: (408) 427-5407.

Automated Customer Service

Scopus Technology has announced Scopus 3.5, which includes support for the Sybase System 10 RDBMS and enhanced collaborative capabilities for dispersed customer support personnel. Additional enhancements include performance improvements of up to 30 percent, Microsoft Messaging Application

Windows-based PC, with clients running on Unisys A and 2200 Series systems. The new Unisys print controller interfaces with UNIX and Novell NetWare servers and virtually any other system that supports LPD/LPR print protocol. It supports most major open communications protocols and network topologies, Centronics and serial printer interfaces, and common printer languages, including HP Printer Command Language (PCL) Levels 4 and 5, PostScript, IBM ProPrinter, Epson, and others.

Unisys DEPCON pricing ranges from \$400 for the DEPCON end user software component to \$8,000 for the enterprise server component. Pricing for UNIX systems ranges from \$400 to \$3,000.

Contact Unisys Corporation, P.O. Box 500, Blue Bell, Pennsylvania 19424-0001, phone: (800) 448-1424, prompt 1.

Compact 4-mm DAT

StorageTek Distributed Systems Division Inc. has announced the 9704

Tape Library System, an automated library for 4-mm DAT cartridges in a compact, 8.5-inch-wide form factor. The 9704, when combined with tape management software, provides unattended and centralized data backup, recovery, and archival functions for UNIX and PC network users. It is the first automated tape library designed exclusively for the UNIX and PC network markets from StorageTek.

The 9704 combines dual Hewlett-Packard DDS-2 helical-scan tape drives with a lightweight, removal carousel that holds 25 DDS-2 cartridges for a total capacity of 100 GB uncompressed or 200 GB compressed. The carousel design allows random access to the cartridges.

The 9704 is available in rackmount or desktop units. Starting list price for the library, which has a one-year warranty, is \$12,000.

Contact StorageTek Distributed Systems Division Inc., 801 Warrenville Road, Lisle, Illinois 60532, phone: (708) 434-1200.

Client-Server Fax

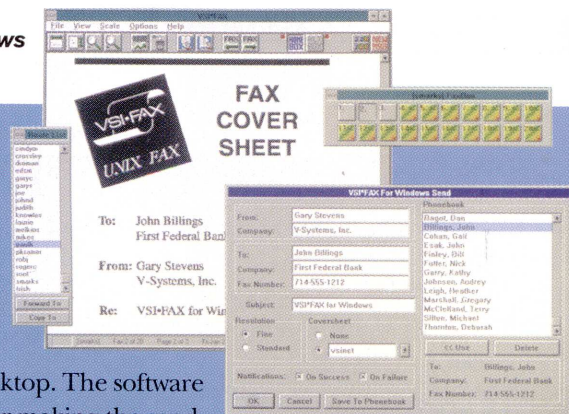
V-Systems Inc. has announced VSIFAX for Windows, which extends the fax software previously available on the HP 9000 Series 700 and 800

to Windows users at the desktop. The software provides an intuitive GUI for making the sending, receiving, viewing, printing, and archiving of fax files fast and easy. It installs like a print driver, so users can be up and faxing within minutes. It allows for faxing directly from any Windows application and makes every fax machine in the world a remote printer for the local user.

Although constructed as a client interface to server software running on a UNIX host, VSI-FAX for Windows does not require that users know UNIX or use UNIX commands and does not require a dedicated fax server.

VSI-FAX server software runs on every major UNIX platform and is priced at \$1,995 for the HP 9000 Series 700 and \$2,495 for the HP 9000 Series 800. VSI-FAX for Windows is priced between \$80 and \$200 per seat, depending upon quantity.

Contact V-Systems, 32232 Paseo Adelanto, San Juan Capistrano, California 92675, phone: (800) 556-4VSI (4874), fax: (714) 489-2486.



Programming Interface support, and Windows and Windows NT clients built on Microsoft Foundation Class Libraries that are fully compliant with the Windows User Interface standard.

Scopus 3.5 takes advantage of key Sybase System 10 enhancements, including query optimization, index performance improvements, and advanced error handling.

Scopus 3.5 is available for Sybase 4.9.2, Oracle, and Windows NT SQL Server; production support for Sybase System 10 was scheduled for shipment in March 1995.

Contact Scopus Technology, 1900 Powell Street, Suite 700, Emeryville, California 94608, phone: (510) 428-0500, fax: (510) 428-1027.

New from Pacer Software

Print Server

Pacer Software, Inc. has announced Version 3.0 of PacerShare and PacerPrint. PacerShare and PacerPrint enable Apple Macintosh networks to integrate with UNIX servers using industry standards.

PacerShare users can make an unlimited number of simultaneous connections. PacerShare users whose UNIX account is managed by NIS can manage their NIS passwords from their desktop. Inactive users are warned, then automatically logged out. HP-UX systems can be configured to run with file names of either 14 or 255 characters.

In PacerPrint, PPD file integration improves the speed and font handling of PostScript printing. Users can set up spoolers to printers that communicate via TCP/IP. Pacer Print integrates Macintosh and UNIX printing resources by allowing Macintosh users to print directly to UNIX server print queues as if they

were Apple LaserWriters or HP LaserJets.

PacerShare and PacerPrint 3.0 were scheduled to be available in April starting at \$3,000 for a 20-user license. The products will be sent free of charge to all corporate and educational customers under maintenance contract.

Desktop-to-UNIX Connectivity

Pacer Software, Inc. has released Version 1.5 of its DAL Server for UNIX, which now offers Windows users the same high level of data access that Macintosh users have had to information contained in UNIX database systems. This is accomplished by providing both DAL and ODBC application programming interfaces (APIs). With DAL for UNIX 1.5, customers can now use desktop applications, such as Excel, Lotus 1-2-3, and Blyth Software's Omnis 7, to directly access important UNIX database information from their desktop of choice.

In addition, Version 1.5 provides easy access to information residing in DB2 UNIX database environments.

DAL Server for UNIX 1.5 was scheduled to be available in April starting at \$4,000.

Contact Pacer Software, 1900 West Park Drive, Suite 280, Westborough, Massachusetts 01581-3919, phone: (508) 898-3300, fax: (508) 366-1356.

TN3270 for UNIX

Apertus Technologies Incorporated has announced EXPRESS TN3270, communications software that links UNIX systems with IBM hosts over TCP/IP. The product is available on all major UNIX platforms, including HP 9000.

EXPRESS TN3270 provides full 3270 emulation, support for many terminal and keyboard models, macro/scripting capability to automate tasks such as host logon, support for thousands of sessions and hundreds of users, simple internationalization for easy configuration for all Latin alphabet languages, and full support for the latest TN3270 extensions (RFC 1647).

EXPRESS TN3270 is available

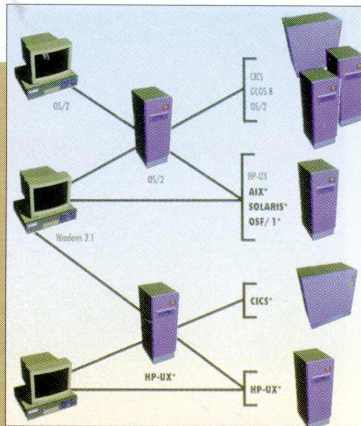
Client-Server Development

Andersen Consulting has announced Version 2.4 of its Foundation for Cooperative Processing (FCP) client-server application-development environment, which adds support for Windows NT clients and IBM AIX, DEC OSF/1, and Sun Solaris's server platforms (HP-UX already supported). It now features message compression to speed transactions in high-usage systems. FCP 2.4 provides integration of productivity tools such as word processors, spreadsheets, and graphical products into the FCP development environment.

FCP provides failover support and system replications. It also supports application partitioning and has an advanced message-based architecture that supports asynchronous processing and UNIX-based peer-to-peer messaging.

FCP 2.4 developer licenses start at less than \$10,000, with additional user charges for production systems.

Contact Andersen Consulting, 69 West Washington Street, Chicago, Illinois 60602, phone: (312) 580-0069.



Foundation for Cooperative Processing (FCP), Version 2.4

starting at \$595 and ranging upward, depending on the number of users.

Contact Apertus Technologies Incorporated, 7275 Flying Cloud Drive, Eden Prairie, Minnesota 55344, phone: (800) 876-7671, e-mail: sales@ssiny.com.

Text Editor

a/Soft Development, Inc. has announced nu/TPU v4.1, an update to its multiplatform text editor for UNIX, DOS, and Windows NT. Version 4.1 brings a host of improvements and added functionality to the editor, especially in the Motif, MS Windows, and Windows NT versions. A new command dialogue allows users to decide where the command line will be located in their editing windows. A new find dialogue makes searches easier. A new system attributes dialogue shows users all the attributes and their settings and allows them to be controlled from within the dialogue with a click of the mouse or a tap on the keyboard. The Motif version can now handle multiprocessing; users can create one or more subprocessors

simultaneously and communicate with them. Processing speed has been significantly improved, as well.

Fonts and colors can be set right from within the editor during a session by specifying the desired variables in a new dialogue. Font style and font size are user-definable. Column modes of 80- and 132-width are supported in nu/TPU v4.1.

nu/TPU pricing starts at \$499 for UNIX, \$199 for DOS, and \$299 for Windows NT.

Contact a/Soft, 24 Eastman Avenue, Bedford, New Hampshire 03110, phone: (603) 666-6699, fax: (603) 666-6460.

NS/VT Access for UNIX

Software Licensing Corporation has announced IX/Connect, an add-on product for its IX/92 terminal emulation software. IX/Connect enables IX/92 users to make network connections to HP 3000 computers using Hewlett-Packard's NS/VT networking protocol. Previously, customers who wanted to connect a UNIX workstation to an HP 3000 via a network needed to

install Telnet and ARPA services on the HP host at considerable expense. The NS/VT connection made using IX/Connect also offers the advantages of faster access and less network traffic.

IX/92 offers HP-UX users full-featured HP2392A terminal emulation for connectivity with HP 3000 host computers and incorporates a script language to automate all or part of any session, including file transfer. Prices for IX/92 terminal emulation software start at \$395 for a single-session version.

IX/Connect is available for HP-UX, Solaris 2, and SCO UNIX. Prices start at \$245 per session. Volume discounts and concurrent session licenses are available.

Contact Software Licensing Corporation, Suite 280, 930 Tahoe Blvd., Unit #802, Incline Village, Nevada 89451-9436, phone: (702) 832-0881 or (800) 831-0882, fax: (702) 832-0883.

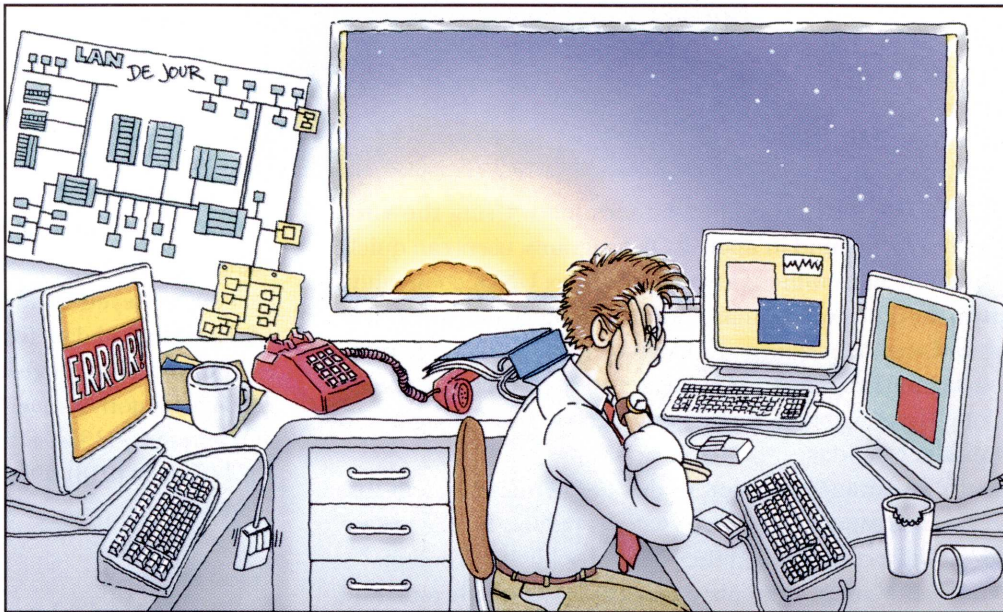
Fault Management

Micromuse PLC (UK) has established a new office in Dallas, Texas. Micromuse USA, Inc. offers an enterprise-wide fault management system through its two products: Netcool/OMNIbus and Netcool/Legacy Watch. OMNIbus consolidates, tracks faults, and correlates events across large networks with diverse management platforms such as HP OpenView, IBM NetView, and SunNet Manager. It integrates tightly with helpdesk applications such as Remedy's ARSystem (also available through Micromuse USA Inc.).

Legacy Watch integrates legacy, non-SNMP devices with standard management platforms.

Contact Ken Barth, Micromuse USA Inc., 15818 Midway Road, Dallas, Texas 75244, phone: (214) 980-8727, fax: (214) 980-8963, e-mail: kba@micromuse.com.

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CIRCLE 13 ON READER SERVICE CARD

Productivity Tools

Pacific Software Group has announced Version 1.5 of TaskManager and TaskManager Pro desktop productivity systems for UNIX. Both TaskManager products provide users with

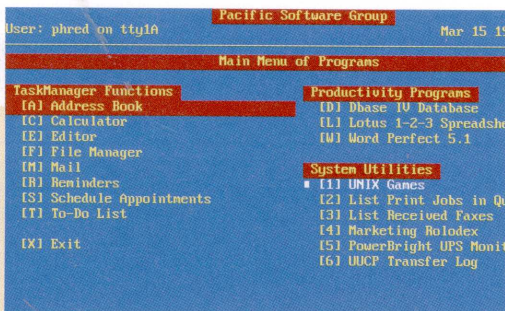
an intuitive, visual interface for character-based terminals. Using the same "point-and-shoot" technology found in many DOS programs, users can quickly access programs and functions without learning complex UNIX commands.

TaskManager provides office-wide e-mail and messaging facilities as well as a due-date tracking and reminder system. TaskManager enables users to build easy-to-use menus to launch programs and execute system commands. Special configuration options are available to restrict user access. TaskManager also includes an appointment calendar.

TaskManager Pro is an advanced version of the TaskManager system that adds a comprehensive file manager and set of systems utilities for navigating through UNIX files and directories called the "QuickTool Utility Toolbox."

TaskManager and TaskManager Pro are available for monochrome and color character-based terminals and monitors on the HP 9000 and other UNIX platforms. A four-user TaskManager license is priced at \$145, and a four-user TaskManager Pro license is \$245.

Contact Pacific Software Group, 10734 Jefferson Blvd., Suite 250, Culver City, California 90230, phone: (800) 949-4490 or (310) 472-5168, fax: (310) 839-8620, e-mail: info@pacsoft.com.



TaskManager Pro, Version 1.5

The pop-up and pull-down menu systems can be modified to individual needs. VDE can be easily customized using standard programming languages and can provide fast online access to keyed Indexed Sequential Access Method data files and tables.

Contact Viking Software Service, Inc., 6804 S. Canton Avenue, Suite 900, Tulsa, Oklahoma 74136-3419, phone: (800) 324-0595 or (918) 491-6144, fax: (918) 494-2701.

Web Browser

The Enterprise Integration Network (EINet) has announced that it has licensed winWeb, its Windows-based World Wide Web browser, to Performance Technology. The winWeb browser is part of Performance Technology's recently Instant Internet product, which provides direct, plug-and-play Internet connection for an entire LAN. Instant Internet is said to be the first complete hardware/software solution that enables simultaneous access to the Internet for all network users on a LAN.

EINet's winWeb browser was first introduced as freeware on the Internet during 1994. According to the company, this browser's stability, excellent performance, and easy-to-use features have made it popular. winWeb requires less memory (almost half as much) than other browsers. winWeb's 16-bit program works with current versions of Windows and does not require installation of the Win32s subsystem.

The browser features full print and print preview capability; support for CERN-style proxy servers; the wplany (Windows-play-any-file) sound player, which detects and plays any sound file through a Windows 3.1 WaveOut, or audio, device; FTP capability; and

CAD Data Translation

Segue, Inc. now has marketing rights in the U. S. and Canada for CADverter, a series of direct translators from Theorem Solutions Consultancy Ltd. (TSC) of Lichfield, England. CADverters read and write native 3-D data, including solids, for Computervision CADDs, IBM Catia, EDS Unigraphics, Spatial Technology ACIS, and EDS Parasolid. All are host-independent.

All types of 3-D entities are supported by CADverter, including trimmed surfaces and solids such as CSG, faceted, exact, and boundary representations. The solids conversion, repair, and healing methods are based on field-proven TSC algorithms that resolve the precision and tolerance issues intrinsic in the conversion of solid models.

Selling price for CADverter starts at \$6,375 for single-unit orders; volume

discounts are available. The translator series works in most UNIX environments, including Sun, HP, and IBM.

Contact Segue, Inc., 423 Pinebluff Drive, Loveland, Ohio 45140, phone: (513) 831-8009, fax: (513) 576-0423, e-mail: 75017.1764@compuserve.com.

Data Entry

Viking Software Services, Inc. has announced that the Viking Data Entry system (VDE) is now available on the HP-UX platform. VDE is intended to provide a complete, versatile set of 4GL tools for the most demanding key entry applications. The software is designed to distribute the data entry function to information sources without sacrificing the speed and accuracy of traditional "heads-down" systems. Its full-screen approach also makes VDE equally effective for "heads-up" applications.

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Tired of checking in on weekends or nights to verify that your data center is running as planned, when you could be spending this time enjoying one of your hobbies. With JMS to schedule and control your batch jobs, and with Callback to monitor your system looking for critical conditions, you can better enjoy your free time knowing that if a problem does occur, you will be notified by phone or pager.

CALLBACK SYSTEM DOWN DETECTOR AND JOB NOTIFICATION SYSTEM

Voice notification for:

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- Console messages
- Printer status
- Logon security
- Special job events
- Physical conditions
- Adverse temperature
- Power loss
- User requests
- Reply pending
- Spoolfile scanning

JMS JOB MANAGEMENT SYSTEM

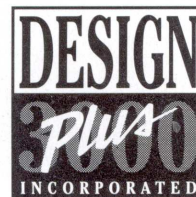
Automated control for the scheduling and execution of batch jobs with very flexible scheduling capabilities and dependencies. Easy to use, no command language to learn and no jcl changes. JMS is a multiple-CPU system that allows jobs to have dependencies across the network. Ad hoc streamed jobs may be incorporated to allow complete batch job control. **Leaders in tools for the "Lights Out Environment". Call us today for a free 30 day demo. MPE/XL or HP-UX.**

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Call 1-800-5 API USA



CIRCLE 59 ON READER SERVICE CARD

UNIX Backups

Enhanced Software Technologies has announced Release 14.2 of BRU, its UNIX backup and restore utility. The latest release is 5 to 30 percent faster than previous versions, the company notes. New features include a tape directory option, selection of files by directory depth, an option for renaming (or moving) files when restoring, backup/restore of raw data partitions, improved support for tape stackers, optional labels on all tapes, improved data compression, better handling of locked files, and more flexible file pattern matching. This release also introduces SmartRestore, which lets BRU restore active shared-library and in-use executable binary files without crashing the system.

Standard features include AUTOSCAN for automatic detection of data errors, error logging, file inclusion/exclusion for selective backups, full/incremental/differential backups, automatic recovery from errors, and tape overwrite protection. BRU will back up and restore all types of files, including special files, links, pipes, and empty directories (which are often skipped by other backup utilities). BRU is said to be significantly more reliable than standard utilities such as tar, cpio, and dump.

BRU can be used as a stand-alone program (for a single system) or can be used to back up large networks. Versions of BRU are available for UNIX systems including HP 9000s. Prices range from \$149 to \$3,499.

Contact Enhanced Software Technologies, Inc., 5016 S. Ash Avenue, Suite 109, Tempe, Arizona 85282, phone: (602) 820-0042, fax: (602) 491-0865.

newsreader capability.

Instant Internet is preconfigured and ready to plug into the LAN hub of a NetWare or POWERLan network. Installation requires no reconfiguration of client workstations or the network server and can be performed in minutes while the network is up.

Contact EINet, 3500 West Balcones Center Drive, Austin, Texas 78759-6509, phone: (512) 338-3544 or (800) 844-4638, Internet: <http://galaxy.einet.net/galaxy.html>.

Workflow Management

Black & White Software, Inc. has announced a new suite of advanced workflow management software: Regatta-DEX, Regatta-X, and Regatta-Win. Fujitsu Open Systems Solutions, Inc. contributed its Regatta workflow technology to the system, while Black & White used its integration technology expertise to integrate Regatta with the interface development tool UIM/X.

Regatta-DEX is a development environment for X Windows that facilitates

the creation of groupware applications. Regatta-X and Regatta-Win are runtime environments that allow deployment of the workgroup/workflow applications developed with Regatta-DEX on UNIX/Motif and MS-Windows systems, respectively.

Developers will gain access to the advanced features of Visual Edge Software, Ltd.'s UIM/X GUI builder and its Visual Action Toolset.

When combined with UIM/X and other X Windows development tools available from Black & White, the Regatta-based suite of products provide a workflow environment that is consistent with all aspects of application development and business process re-engineering. The software is completely portable.

Regatta-DEX is available on Solaris platforms at \$6,900 (quantity one) and Regatta-X is available now on Solaris platforms at \$2,250 (quantity one). Both are compatible with Sybase databases. HP platforms were scheduled to be supported in the second quarter of 1995.

Regatta-Win was scheduled to be available in the second quarter on Microsoft Windows at \$990 (quantity one).

Contact Black & White Software, 2155 Bascom Avenue, Suite 210, Campbell, California 95008, phone: (408) 369-7400, fax: (408) 369-7406.

Accelerator Support

Database Excillation Systems (DES) has announced that it has signed a Systems Support agreement with HP, irrespective of whether DES customers operate on HP machines. Support will be provided through HP's Business Alliance Program. The new agreement includes HP Support Engineers to help companies with their hardware support; next-day, onsite response (8 a.m. to 5 p.m., Monday through Friday); same-day and 4-hour response in the future; HP service price for the first year included in the one-year DES factory warranty; service pricing for the succeeding (out-of-warranty) years through HP to the customer; and availability of additional HP onsite services.

Each DES customer will be assigned to a single HP Response Center with access to an HP Support Engineer. If customers require assistance, HP will dispatch a customer engineer to the site.

Contact DES, 3080 Oakmead Village Drive, Santa Clara, California 95051, phone: (408) 727-5497, fax: (408) 727-5496, e-mail: info@desdbx.com.

World Wide Web Presentation

Visual Engineering announced Release 2.0 of Ovation presentation graphics software for UNIX workstations. Ovation 2.0 is said to be the only presentation software product designed to help users publish presentations electronically via the World Wide Web.

Interex is your HP-UX advocate

ad • vo • cate: to plead in favor of, *see support*

HP-UX users can rely on Interex, a 7,500-strong membership organization, as a powerful channel to Hewlett-Packard.

Interex is committed to supporting HP-UX users through volunteer committees and special interest groups:

SIGUNIX—The Special Interest Group for UNIX, meets at the annual Interex HP Computer Users Conference to discuss areas of concern unique to HP-UX users and to share solutions.

Systems Improvement

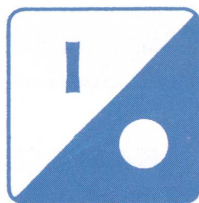
Committee/HP-UX—The SIC HP-UX pinpoints specific user needs for the HP-UX operating system and presents its requests for system upgrades, etc. to Hewlett-Packard.

Advocacy Coordinating

Committee—The Advocacy Coordinating Committee facilitates communication between HP-UX users and Hewlett-Packard, enabling users to have specific concerns referred directly to the accountable HP entity. This committee tracks and manages all advocacy requests and publicly discloses the outcome of all advocacy issues.

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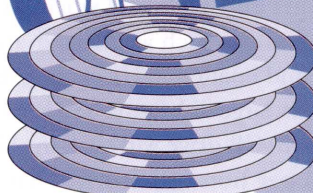
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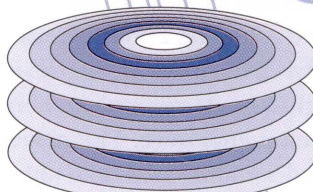
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CIRCLE 31 ON READER SERVICE CARD

PC-to-UNIX Connectivity

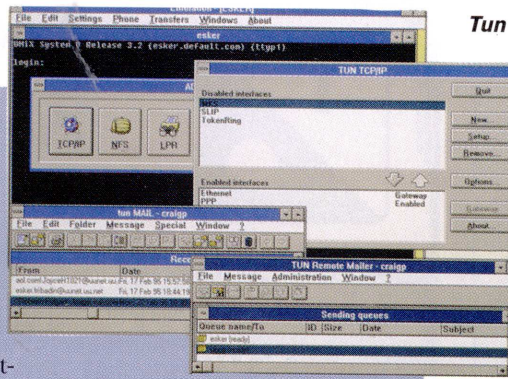
ESKER has announced the latest upgrade to Tun PLUS 7.3, a combination package that includes TCP/IP, terminal emulation, and e-mail capabilities.

Tun PLUS 7.3's complete suite of products enables Windows and DOS users to be easily integrated into multiplatform UNIX environments. With Tun PLUS 7.3, PC users can seamlessly access host-based UNIX applications from their Windows desktop. The advanced features of Tun PLUS 7.3 also provide users with easy access to remote resources such as e-mail and file sharing.

Tun PLUS 7.3 is priced at \$345 for a single Tun PLUS PC user.

Some of the products' updated features include e-mail messaging capabilities, DLL-compatible TCP/IP multinet kernel, full support of UUENCODE and MIME protocols, complete e-mail capabilities for remote users, PPP and SLIP interfaces, and a drag-and-drop FTP for Windows applications with multihost connectivity and a toolbar.

Contact ESKER, 1181 Chess Drive, Suite C, Foster City, California 94404, phone: (415) 341-9065, fax: (415) 341-6412.



Tun PLUS 7.3

tion display. The ACT645 and ACT647 are 5- and 7-cartridge libraries with 200-GB and 280-GB capacity, respectively.

Contact Aviv Corporation, 4 Fourth Avenue, Burlington, Massachusetts 01803, phone: (617) 270-6900, fax: (617) 270-5727.

Remote PC Control

UniPress Software, Inc. and Triton Technologies, Inc. are now shipping CoSession/PC2X, a PC-UNIX connectivity solution. The DOS computer displays in an X Window or X terminal on a UNIX workstation. The DOS computer displays in an X Window from which users can run PC applications, including MS Windows and MS Windows applications. Users can control multiple PCs simultaneously, by running several CoSession/PC2X windows.

CoSession/PC2X also turns a UNIX X Window into a virtual PC from which users can run DOS and Windows programs. Support for copy-and-paste lets users easily share files and transfer data between DOS and UNIX applications.

CoSession/PC2X is a client-server application. The server side of the software resides on one or more PCs. It provides the full PC session to the CoSession/PC2X client, which runs on a UNIX workstation.

CoSession/PC2X runs on Sun, IBM, and HP workstations. A single-user starter pack, which consists of one PC host and one UNIX client, costs \$595. Additional CoSession/PC2X UNIX client sides cost \$495, and additional PC host sides cost \$125, with a 10-pack host side available for \$995.

Contact UniPress, 2025 Lincoln Highway, Edison, New Jersey 08817, phone: (908) 287-2100, fax: (908) 287-4929.

Gateway Place, Suite 318, San Jose, California 95110, phone: (408) 452-0600, fax: (408) 452-0632, e-mail: info@ve.com, WWW <http://www.cdrom.com/pub.viseng>.

Tape Drive and Libraries

Aviv Corporation has announced a 40-GB DLT format tape drive and 5- or 7-cartridge libraries for total unattended capacities of 200 to 280 GB. The 40-GB drive has transfer rates of 3.0 MB/sec-ond. It addresses the needs of network servers and high-end workstations in applications such as imaging, multimedia, and unattended backup of database servers, large disk farms, and RAID arrays.

A 40-GB drive will back up 11 GB of data per hour. DLT drives have hardware compression and compaction capabilities and all the performance data are stated assuming 2:1 compression ratio.

Aviv DLT drives are in 5.25-inch full-height form factor and are housed in a tabletop enclosure. The Aviv ACT640 includes a 40-GB DLT drive with an information display, while the ACT620 includes a 20-GB drive and an informa-

Ovation creates a Web presentation by building a set of documents in the Web's Hyper Text Markup Language (HTML) format. Documents are created automatically and contain Ovation's full range of graphics capabilities, including charts and graphs, bullet slides, diagrams, and imported clip art. Ovation's Web presentations can contain "hot regions" that reference other documents, such as background material or notes. An Ovation Web presentation can either run as a conventional electric slide show or can serve as a launching point for other Web documents.

The software also adds support for presentation files created in Microsoft PowerPoint for Windows and Macintosh. Ovation now offers the capability to import PowerPoint presentation files, preserving features such as outlines, graphics, charts, and master slides.

Ovation 2.0 is priced at \$795 per user and was scheduled to be available for all popular UNIX environments by late May. Ovation users with a current maintenance subscription will automatically receive upgrades free of charge.

Contact Visual Engineering, 2025

Workgroup Solution

Uniplex Software, Inc. has announced onGO Office Version 2.0, which includes electronic mail, calendaring, scheduling, and directory and resource management capabilities. Organizations with a variety of mail, communications, and networking systems can integrate these technologies, yet still allow users their choice of business applications and mail clients across a range of hardware.

onGO Office uses standards-based (X.400) addressing, utilizing a variety of transports such as TCP/IP, IPX/SPX, and PC LANs. It supports OSF/Motif workstations, X terminals, Microsoft Windows, and character terminals. onGO Document Agent Services (DAS) ensure that the content of messages and documents are accessible to every onGO Office user regardless of the applications used to create them and the applications the recipient currently uses. A common database is now provided for both mail addressing and scheduling, enabling event and resource scheduling over multiple sites and time zones.

With onGO Office Version 2.0 for OpenMail, users of Hewlett-Packard's OpenMail messaging system can also benefit from onGO Office's advanced workgroup functionality.

onGO Office was scheduled to be available for HP-UX by the second quarter of 1995.

Contact Uniplex, 600 East Las Colinas Blvd., Suite 1400, Irving, Texas 75039, phone: (800) 356-8063 or +44(0)1442-230330.

Cross-Development Kit

MainSoft Corporation has announced MainWin 1.2. New functionality includes the Microsoft Help Engine

and the 32-bit Microsoft Foundation Classes (MFC 3.0). MainWin 1.2 was scheduled to be available in mid-April. MainSoft will continue to support MainWin 1.1 for use with applications written to Windows 3.1.

MainWin's performance has been improved significantly. Response time of complex dialogues with the MainWin 1.2 library has been increased by 4 to 8 times over the MainWin 1.1 library. This release also features performance increases for bitmap operations of up to 4 times. Additionally, MainWin 1.2 offers full support of Windows raster operations—256 three-way ROPs for source, designation, and brush (enabling watermarks and stamps, for example).

The MainWin 1.2 library also features improved integration of the Windows palette scheme with the X11 color models.

DEC Alpha with OSF/1 becomes a formally supported MainWin platform with the 1.2 release. MainWin 1.2 offers continued support for HP 9000s and other systems.

Contact MainSoft, 1270 Oakmead Parkway, Suite 310, Sunnyvale, California 94086, phone: (408) 774-3400, fax: (408) 774-3404, e-mail: info@mainsoft.com, World Wide Web: www.mainsoft.com.

NFS for Macintosh

Thursby Software Systems, Inc. (TSS) has announced MacNFS, a high-performance NFS client for the Macintosh.

MacNFS provides Macintosh users with NFS capabilities, allowing high-performance file sharing between the Macintosh and UNIX systems. MacNFS was designed for the Macintosh, not ported from a PC implementation. MacNFS allows Macintosh users UNIX file sharing with record locking. MacNFS is both PowerPC and Open Transport

ready. MacNFS also offers complete PCNFS security.

MacNFS is priced at \$249.

Contact Thursby Software Systems, Inc., 5840 W. Interstate 20, Suite 100, Arlington, Texas 76017, phone: (817) 478-5070, fax: (817) 561-2313.

File Transfer

Intech, Ltd. has announced DIALAFILe for HP 9000 computers. This is the latest arrival to the DIALAFILe family. DIALAFILe HP-UX is fully compatible with different machine versions of DIALAFILe. The main feature is the product's ability to do unattended remote polling from the HP 9000. Any type of file can be transferred, including ASCII and binary. DIALAFILe was written specifically for the telephone system, allowing it to take full advantage of cheap rates. It works over national and international lines.

File transfer can take place between the following computers: HP 1000, HP 3000, DEC VAX, SCO UNIX, and DOS PCs. DIALAFILe requires a Hayes-compatible modem and relevant communications port. The system has full security and error-checking features.

Contact Intech, Ltd., Vale Industrial Estate, Horwich, Bolton, England BL6 5HT, phone: (0204) 699660, fax: (0204) 695172. □

Attention vendors: New product announcements should be sent to New Products Editor, hp-ux/usr Magazine, Interex, P.O. Box 3439, Sunnyvale, California 94088-3439, USA.

Deadline for submission is two months prior to publication.

New Products refers to numerous products by their trade names. In most cases, these designations are claimed as trademarks or registered trademarks by their companies.

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- Access to Special Interest Groups (SIGs)
- Member rates for Interex Conferences
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READER SERVICE NUMBER	ADVERTISER	PAGE #
52	Abtech (800) 474-7397	51
6	Brixton Systems (800) BRIXTON	25
30	Camintonn/Z-Ram (800) 368-4726	C-2
172	ColorSoft (619) 459-8500	29
150	Computer Marketing International (800) 497-4264/Fax: (508) 689-2031	39
15	Computer Solutions (407) 649-0123 Fax (407) 649-1407	79
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140	C.S.U. Industries, Inc. (516) 239-4310/Fax: (516) 239-8374	19
35	Db-TECH (800) 234-4500	85
43	Dallastone (603) 647-8168	43
51	Data Assurance (800) 654-1689	77
34	Design 3000 Plus, Inc. (503) 585-0512/ Fax: (503) 585-1706	105
121	Diamond Optimum Systems, Inc. (818) 224-2010 or (800) 362-8271	31
31	Eagle Software (800) 477-5432	107
11	Enabling Technologies Group (404) 642-1500	87
56	GE Capital (800) GE-RENTS	91
28	HICOMP (800) 323-8863, Fax (713) 626-3654	87
105	I/O Data Systems, Inc. (216) 835-2211/Fax: (216) 835-0220	107
157	IEM, Inc. (970) 221-3005 or (800) 321-4671/ or /e-mail: info@iem.com	9
92	ITAC Systems, Inc. - Mouse-Trak (214) 494-3073/Fax: (214) 494-4159	5
58	Inclination Software (702) 831-5595	45
10	International User Conference '96 +358-0-752 3611, Fax +358-0-752 0899	2
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7	Monterey Bay Communications (408) 429-6144/Fax: (408) 429-1918	1
57	Morning Star Technologies (800) 558-7827/Fax: (614) 459-5054	3
107	Newport Digital Corporation (800) 383-3642/Fax: (714) 730-3951	75
26	ORBIT Software (800) 6-Online or (510) 837-4143	47
86	Perfect Software Solutions (800) 741-99HP	37
95	Pericom, Inc. (609) 895-0404/Fax: (609) 895-0408	69
71,13	Platinum Technology (800) 551-7528	17,103
54	Qualix Group (415) 572-0200	15
152	RAC Consulting (206) 357-9572/Fax: (206) 352-8453	79
4	Robelle Consulting Ltd. (604) 582-1700/Fax: (604) 582-1799	61
29	SBE (800) 214-4SBE	59
33	Software Licensing Corp. (702) 832-0881	97
143	Technical & Scientific Application (800) 422-4872/Fax: (713) 935-1555	67
49	Ted Dasher & Associates (800) 638-4833/Fax: (205) 591-1108	43
106	Telamon (916) 622-0630/Fax: (916) 622-0738	39
53	Tryonics (800) 551-6236	C-3
72	Unison Software (408) 988-2800	13
40	VESOFT, Inc. (310) 282-0420/ Fax: (310) 785-9566	53
39	Workstation International (612) 449-9000	63
	Walker Richer & Quinn, Inc. (800)92-NETWORK	C-4

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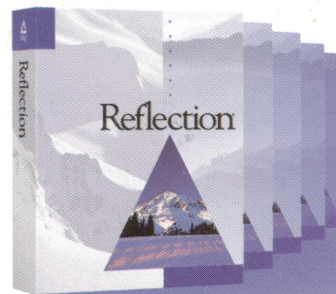
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